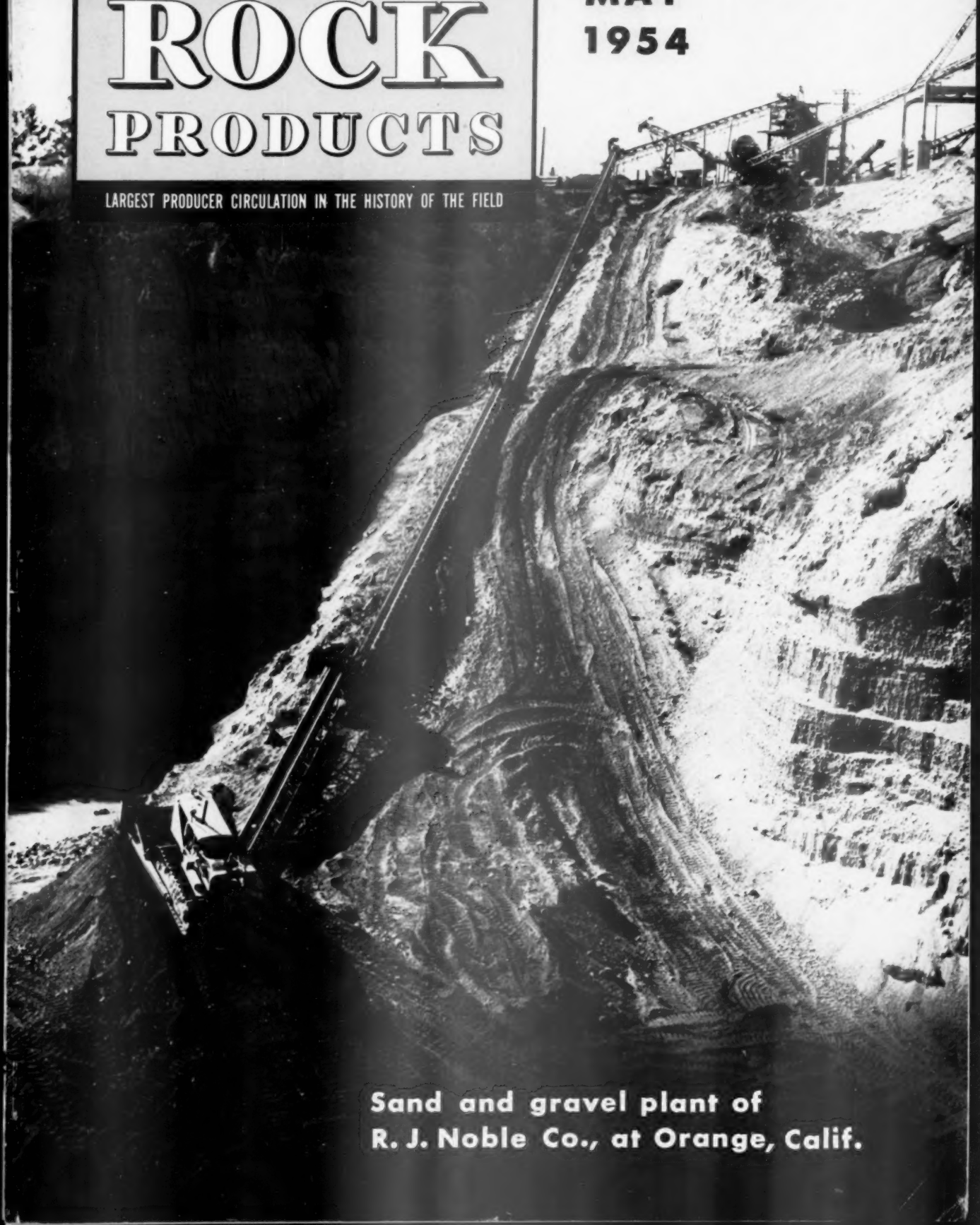
THE INDUSTRY'S RECOGNIZED AUTHORITY

ROCK PRODUCTS

LARGEST PRODUCER CIRCULATION IN THE HISTORY OF THE FIELD

MAY 1954

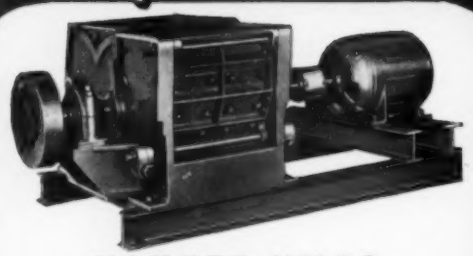


Sand and gravel plant of R. J. Noble Co., at Orange, Calif.

Crush It! Grind It Separate It

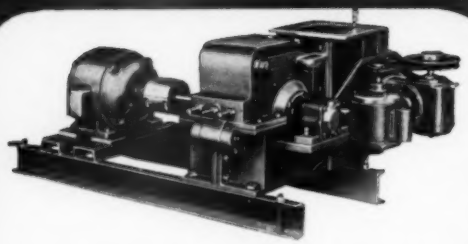
Do It Better, Faster And At Less Cost With...

WILLIAMS



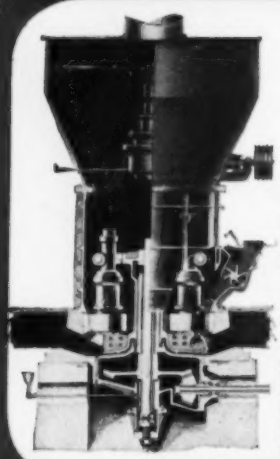
HAMMER MILLS

For heavy duty crushing or grinding of virtually any mineral or chemical—Williams builds them to do *a complete job in one operation!* Primary and secondary crushers are unnecessary—extra foundations, conveyors, other equipment are eliminated! You can save up to 75% on initial investment—up to 50% on grinding costs with the right Williams Hammer Mill!



HELIX-SEAL HAMMER MILLS

For cleaner, safer dustless grinding of dry materials—or non-clogging, accurate grinding of wet, sticky or greasy materials—to finenesses of 100 to 325 mesh. Combines the advantages of a hammer mill with closed-circuit screw-type feed. No separators, fans or cyclones required. Available with steam or water jackets. Low investment—inexpensive to install and operate.



ROLLER MILLS

WITH AIR SEPARATION

For accurate, uniform pulverizing or blending. Instantly adjustable to finenesses down to 400 mesh, even micron sizes. Dries and grinds simultaneously. Automatic, self-adjusting feed. Many other exclusive engineering and construction features. Williams Roller Mills have set new standards for product quality, output and economy.

OTHER WILLIAMS EQUIPMENT

IMPACT and DRIER MILLS
AIR SEPARATORS
VIBRATING SCREENS
COMPLETE "Packaged" PLANTS For Installation In Existing Buildings

At Your Service

WILLIAMS TESTING LABORATORY

Consult Williams on any grinding, crushing, shredding or separation problem, no matter what the material. The most complete testing and research facilities are available without cost or obligation. Simply furnish enough raw material for a test run, and a sample or description of the finished product desired.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
800 St. Louis Avenue ST. LOUIS, MO.

WILLIAMS

CRUSHERS GRINDERS SHREDDERS

OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD

Here's a chain designed specifically for abrasive elevator-conveyor service

Ideal for elevating and conveying under severely abrasive conditions, Link-Belt Class 800 Ley bushed chain is used on a bucket elevator with 16" x 8" cast buckets.

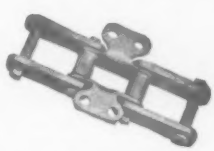
It's long-life LINK-BELT Ley bushed chain that assures less downtime

If you're handling abrasive materials, you'll appreciate the extra wear Link-Belt builds into its Ley bushed chain. The barrels of this rugged cast chain have renewable hardened steel bushings in which steel pins ride. For extraordinarily severe service, manganese steel bushings and alloy steel pins can be furnished.

The design and manufacturing refinements that go into the Ley bushed line are typical of the care that Link-Belt gives to every detail of every chain. And, because Link-Belt builds a complete line, you're sure to get the one best-suited to your exact requirements. Ask your Link-Belt representative or distributor for all the facts on Link-Belt chains and sprockets today.

No ONE chain serves every purpose — get the RIGHT one from LINK-BELT's complete line

LXS chains are made to close tolerances from carefully selected steels. Ideal for rugged drive and conveyor service.



Class C combination chain —popular, durable, low-cost design for elevators and conveyors.

Class SS bushed roller chain with straight sidebars—for practically any conveyor or elevator.

Link-Belt "Flint-Rim" cast sprockets give extra long life. Cast steel sprockets for most severe service.

LINK-BELT

13.514

CHAINS & SPROCKETS

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

MAY, 1954

ROCK PRODUCTS

THE INDUSTRY'S RECOGNIZED AUTHORITY

VOL. 57, No. 5

Bror Nordberg
Editor

Nathan C. Rockwood
Editorial Consultant

This Month

What's Happening 33

Editorial—Problem of Noise in Industry Has Serious Implications 47

Rocky's Notes—Working Tools for Rock Products Research 49

People in the News 51

Labor Relations Trends 55

Industry News 57

Hints and Helps 60

New Machinery 62

Solvay Mines High-Calcium Limestone for Chemical Use 66
Solvay Process Division, Allied Chemical & Dye Corp., enlarges operations taken over from Columbia Quarry Co., at Prairie du Rocher, Ill. *Bror Nordberg*

Laboratory Tests Prove Cements Are Better *E. L. Howard* 69

Problem of Fine Sand Recovery at Folsom Dam 70
Aggregate processing plant at Folsom Dam uses rod mills, sand sizers and liquid cyclones to obtain desired fines to meet difficult specifications *Walter B. Lenhart*

Producing Plant Mixed Materials for Stabilized Base Course 74
Crushed stone producers supplying heavy tonnages of stabilized base course materials for North Carolina State Highway Department *Walter B. Lenhart*

Silica Cement—Strength and Heat of Hydration Properties *Dr. T. Yoshii and K. Kaneko* 80

Automatically-Controlled Kilns and Fuel System for Lightweight Aggregate Plant 83
Carolina Solite Corp., near Aquadale, N. C., manufactures lightweight aggregate from a hard slate. Electronic control for pulverized coal preparation *Walter B. Lenhart*

Producing Pulverized Dolomite Products 88
James River Hydrate and Supply Co., Buchanan, Va., has ten roll-type, air-swept mills manufacturing agricultural and chemical products down to micron size *Bror Nordberg*

Operating Results with Secondary Drill 96
Drilling machine, developed originally by quarry operator, now being used in many types of quarries

Sand and Gravel Industry Produces Largest Tonnage of Minerals 104
With an annual production of over 400,000,000 tons, the sand and gravel industry exceeds all other non-fuel mineral industries *J. R. Thoenen*

Efficient Operation of Dryers *Lee Walter* 116

CONCRETE PRODUCTS—

Prestressed Slabs and the Lift-Slab Building Method 139
New method of construction has opened a wider market for ready-mixed concrete *M. M. Lemcoe*

Lime, Fly Ash, Silica and Cement in Autoclaved Concrete Products 142
Report of investigations at the Research Foundation of the University of Toledo sponsored by National Lime Association and others *John K. Selden*

Push-Button Ready-Mixed Concrete Plant operated by Frank J. Knight Co. *Hubert C. Persons* 144

The Story of the Ready-Mixed Concrete Industry 152
20. A producer reviews the ready-mixed concrete industry *Jas. A. Nicholson*

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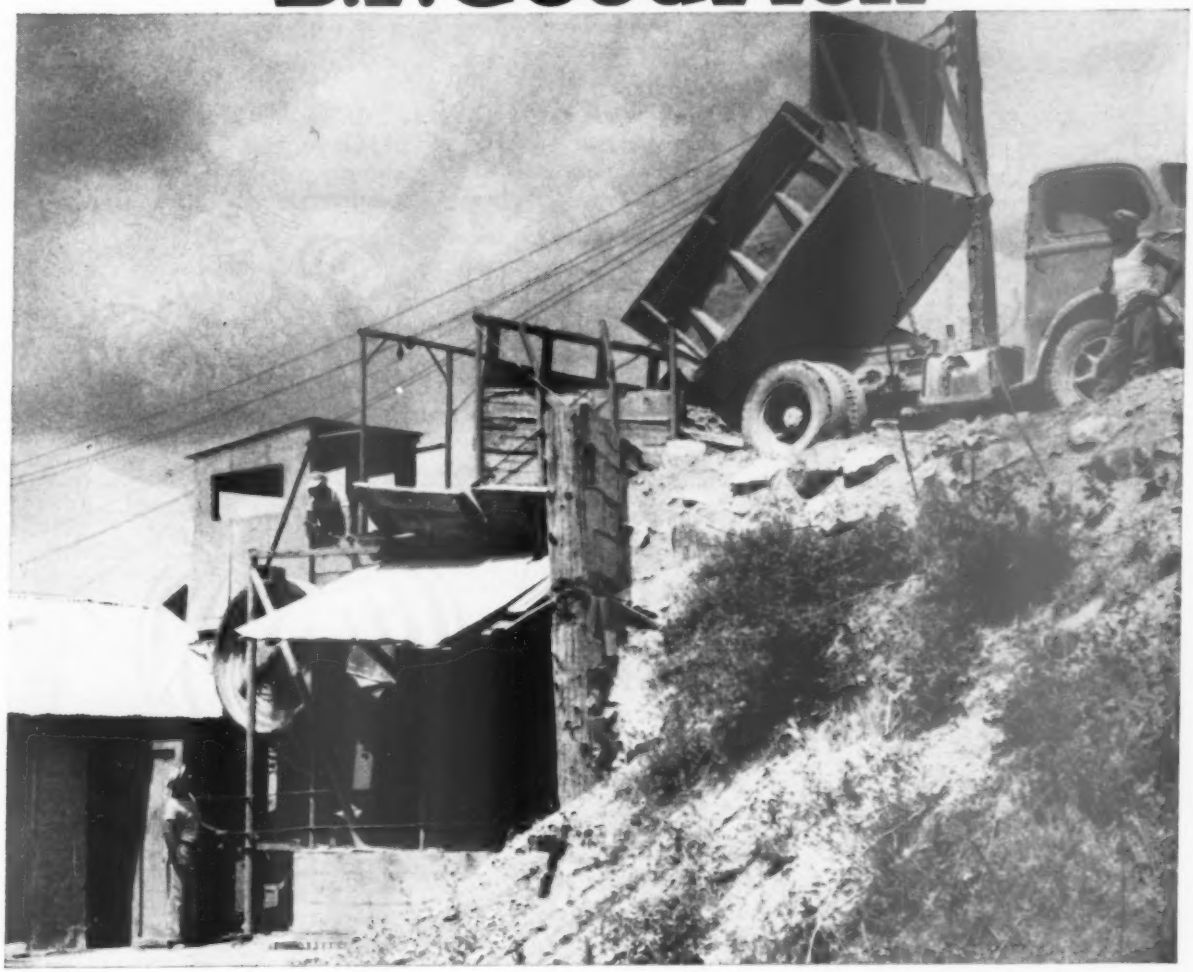
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Again! Longer life, greater savings with Grommet V belts

Rock company saves 3 ways with B. F. Goodrich V belts

ROCKS by the truckload are dumped in that crusher, and reduced to the right size for highway construction. But the jolting action is rough on the V belts that run the crusher. Ordinary belts suffered from shock loads, wore out fast. Time outs for belt replacements brought the whole plant to a standstill.

When the company told a B. F. Goodrich man about the trouble, he recommended a switch to Grommet V belts. The belts you see here had been at work three years when the picture was taken without any shutdowns whatever for maintenance.

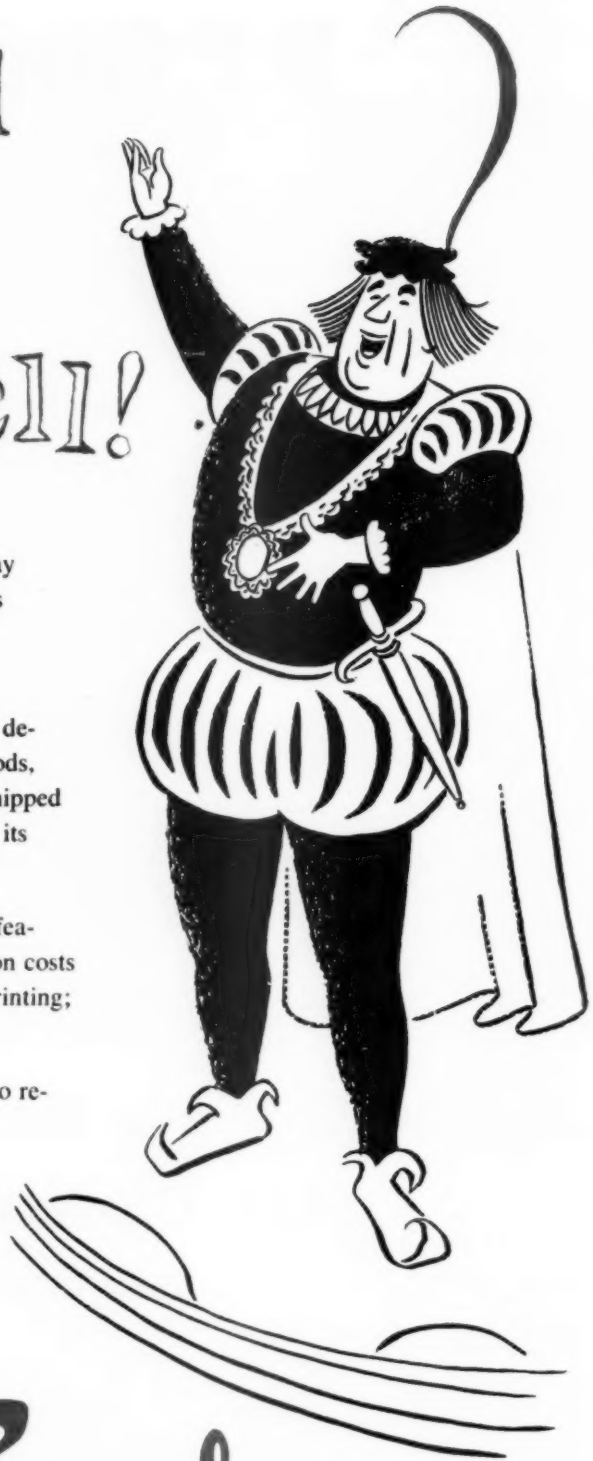
No wonder B. F. Goodrich Grommet belts outlast and outperform ordinary belts. In Grommet belts, all the load-carrying cords are concentrated in twin grommets. These grommets are cord loops made like giant twisted cables except that they're endless. Since there are no center cords, the Grommet belt is more flexible, and so can "give" temporarily and absorb shock loads. As a result, Grommet belts last 20 to 50% longer, depending on the service.

This company, like many others, is making a 3-way saving with Grommet V belts. First, they save on replacement costs because Grommet belts last longer. They save on production costs with no shutdowns caused by belt failures. And they save on maintenance costs because these belts need less attention. Yet the savings they make are clear profit because Grommet belts cost not one cent more than ordinary V belts. Next time you need V belts, order Grommet V belts from your BFG distributor. Or write *The B. F. Goodrich Company, Dept. M-226, Akron 18, Ohio.*

Grommet—T.M The B.F.Goodrich Co.

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

all's well that ends well!



THIS TITLE of a Shakespearean comedy may well apply to the shipment of commodities in Multiwalls which prevent the tragedy of waste in transit.

In designing Raymond Multiwalls we first determine, through sound engineering methods, all stresses caused by the product to be shipped and then produce the sack that will assure its safe delivery by any type of carrier.

Safe construction (with special protective features when required); savings in production costs wherever practical; clean, sharp, legible printing; and deliveries *when promised*.

Call in a Raymond man. Maybe it's time to review *your* package needs.
THE RAYMOND BAG COMPANY,
Middletown, Ohio. Phone 2-5461.

Raymond

MULTIWALL PAPER SHIPPING SACKS

ROCK is this Business!

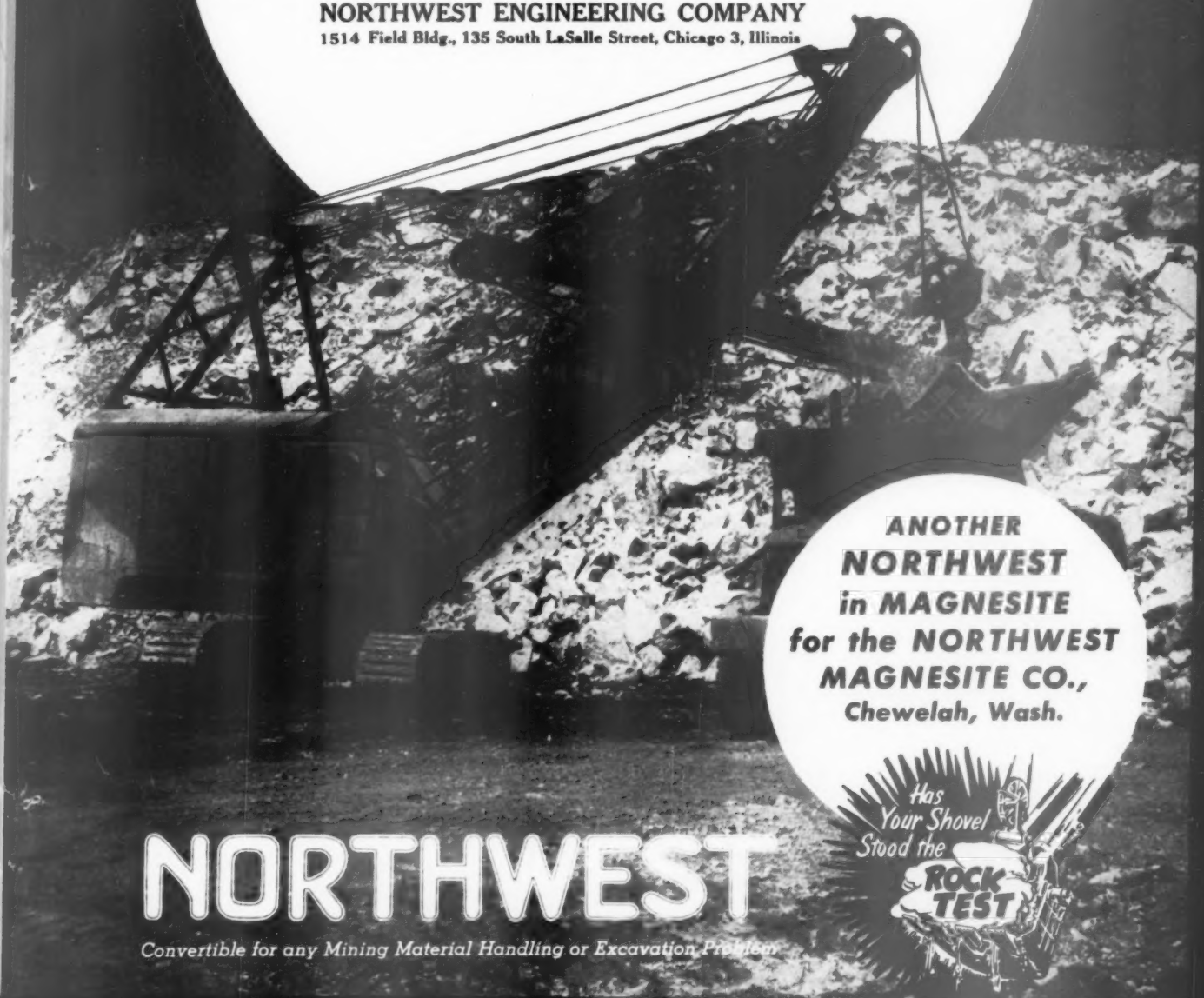
HERE'S as nice a bit of shovel busting material as anyone would like to stick a machine into! This is magnesite, a dense, compact and rare mineral used in furnace lining and as a source of magnesium.

The Northwest is owned by the Northwest Magnesite Company of Chewelah, Wash. *(no relation to us)*, and it's the second Northwest this company has purchased.

Northwests are meeting the "rock test" on jobs like this all over the country. Your Northwest is a *real* Rock Shovel and when you have a *real* Rock Shovel you don't have to worry about output in any kind of digging. Greater crowding force, smoothness of dipper control, easier operation and accuracy in spotting are just a few of the advantages that Northwests bring you. They are advantages that mean money on all hard rock work.

Northwest dependability and high output has made one out of every three Northwests sold a repeat order. There is no better testimonial!

NORTHWEST ENGINEERING COMPANY
1514 Field Bldg., 135 South LaSalle Street, Chicago 3, Illinois



ANOTHER NORTHWEST in MAGNESITE for the NORTHWEST MAGNESITE CO., Chewelah, Wash.

Has Your Shovel Stood the ROCK TEST

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

No engine repairs in 12,300 hours!

The Caterpillar D13000 Diesel in this 1½-yard Link Belt Speeder dragline has needed two valve adjustments in more than 12,300 hours – and *nothing else!* "Not even cleaning the carburetor of the starting engine," says Bruce Harris, superintendent of Northern Virginia Construction Co.

This rugged Cat* Diesel loads 1800 yards of sand and gravel every ten-hour day, 24 days a month, the year around. "We have cold, damp weather from the ocean in the winter, and sand and dust in the summer, but our D13000 keeps on purring," Mr. Harris says. "We're really getting economical operation."

And, if you're interested in economy, here's more: all Caterpillar Diesels can deliver full power, and idle without fouling, on low-cost No. 2 furnace oil. And to cut costly down time to a minimum, your nearby Caterpillar Dealer is always ready to provide fast, skilled service and genuine factory parts.

There are 12 sizes of engines and electric sets to 500 HP and 315 KW. Leading manufacturers can supply Caterpillar power in their equipment; and when it's time to repower, it's time to see your Caterpillar Dealer. Ask him today for on-the-job performance *proof* of the dependable, pamper-free Cat Diesel that's best suited to *your* requirements.

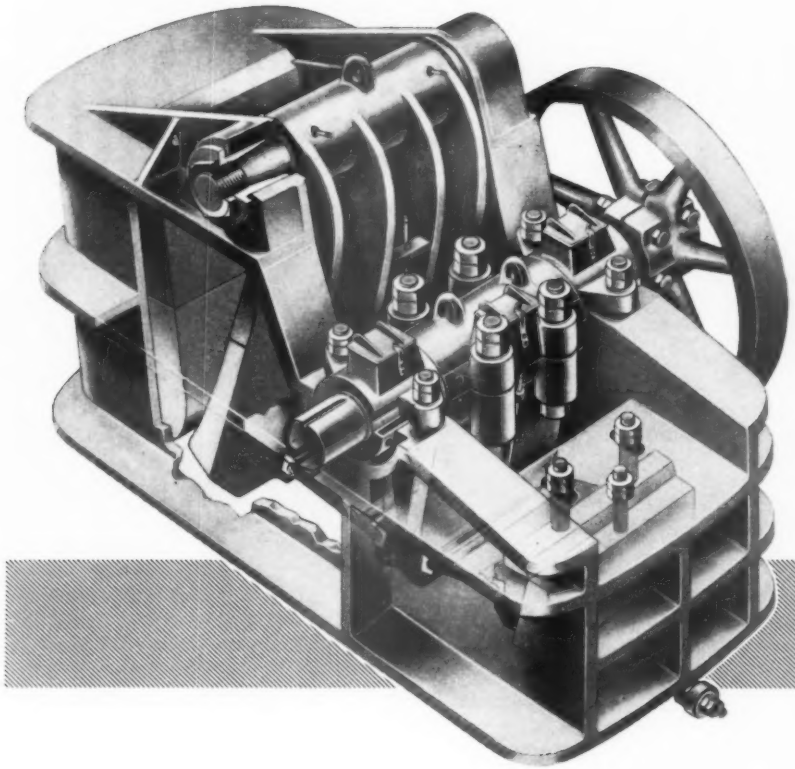
Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

SPECIFY CAT POWER FOR HIGH-PROFIT PERFORMANCE

this "bottleneck" boosts production!



The production capacity of a quarry depends upon the output of the crusher. Poor crusher performance creates a "bottleneck". One sure way to relieve this "bottleneck" is to employ crushers built for greater efficiency and dependability in operation. Traylor Jaw Crushers use their curved crushing surfaces to ease the squeeze on your production bottleneck.

Get more production . . . cut down time . . . with curved jaw plates. Primary reason for the steady production of Traylor Jaw Crushers is their original curved jaw plates. These surfaces outwear conventional plates by as much as 3 to 1 because of the scientific application of crushing power. Also, with Traylor's curved jaw plates, a finer product in greater capacity is secured, at no increase in power. IN FACT, TRAYLOR CRUSHERS REQUIRE LESS POWER PER TON OF ROCK CRUSHED THAN ANY OTHER JAW CRUSHER.

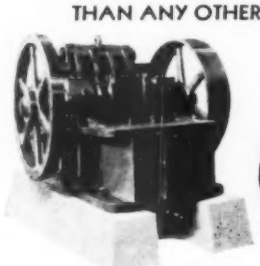
TYPE H AND HB

Traylor Type H and HB Crushers offer capacities ranging from 4 to 210 tons per hour (Type H) and from 120 to 640 tons per hour (Type HB). Bulletin 4105 gives complete specifications and details on all the features of both the H and HB Jaw Crushers. Send this coupon for your copy today.

TRAYLOR ENGINEERING & MFG. CO.
645 Mill St., Allentown, Pa.
Sales Offices: New York • Chicago • San Francisco
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P.Q.

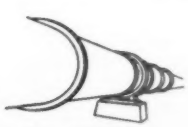
Send complete information on H and HB Jaw Crushers immediately.

Name: _____
Position: _____
Company: _____
Address: _____ State: _____



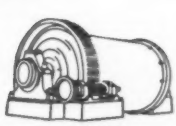
A Traylor LEADS TO GREATER PROFITS

Primary Gyratory Crushers

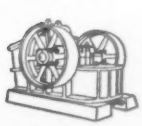


Rotary Kilns

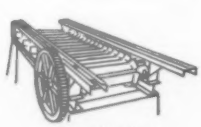
Secondary Gyratory Crushers



Ball Mills



Jaw Crushers



Apron Feeders

on the record...

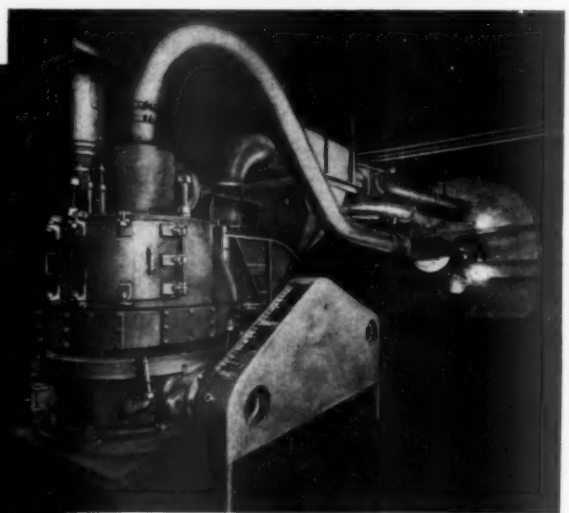
SUSTAINED HIGH PRODUCTION

Here are five primary, factual reasons why B&W Type E Pulverizers are so widely used for direct-firing of rotary kilns . . . have established outstanding records of uniformly high performance in extended continuous service, reflected in maximum production . . . have consistently delivered full rated capacity year after year.

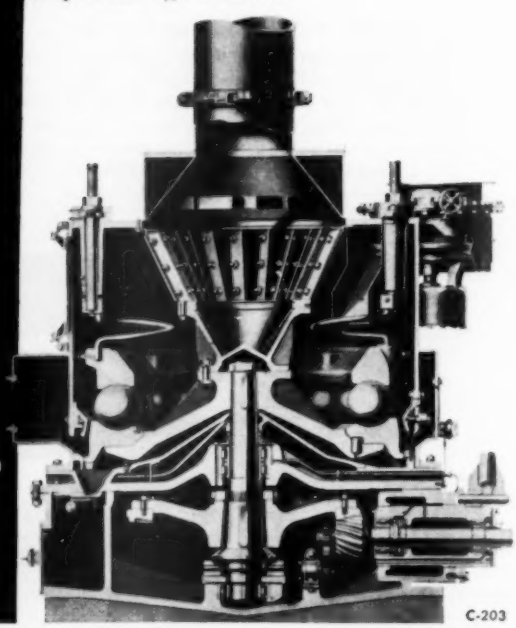
1. Grinding zone has no bearings or parts to be lubricated.
2. No internal adjustments are required.
3. Grinding elements are made of wear-resistant, long-life metals, with grinding balls held to close spherical tolerances.
4. Fully-enclosed reduction gear drive, with anti-friction bearings, has integral pump for automatic pressure lubrication.
5. Automatically rejects tramp iron and pyrites without damage to grinding elements or interruption of service.

Extensive, continuing B&W research findings plus the experience accumulated over many years of manufacture and application, are incorporated in the design and rugged construction of the B&W Type E Pulverizer . . . assure that it more than meets every requirement for efficient and economical firing in modern kiln-operating practice. The Babcock & Wilcox Company, Boiler Div., Process Equipment Dept., 161 East 42nd St., New York 17, N. Y.

BABCOCK & WILCOX



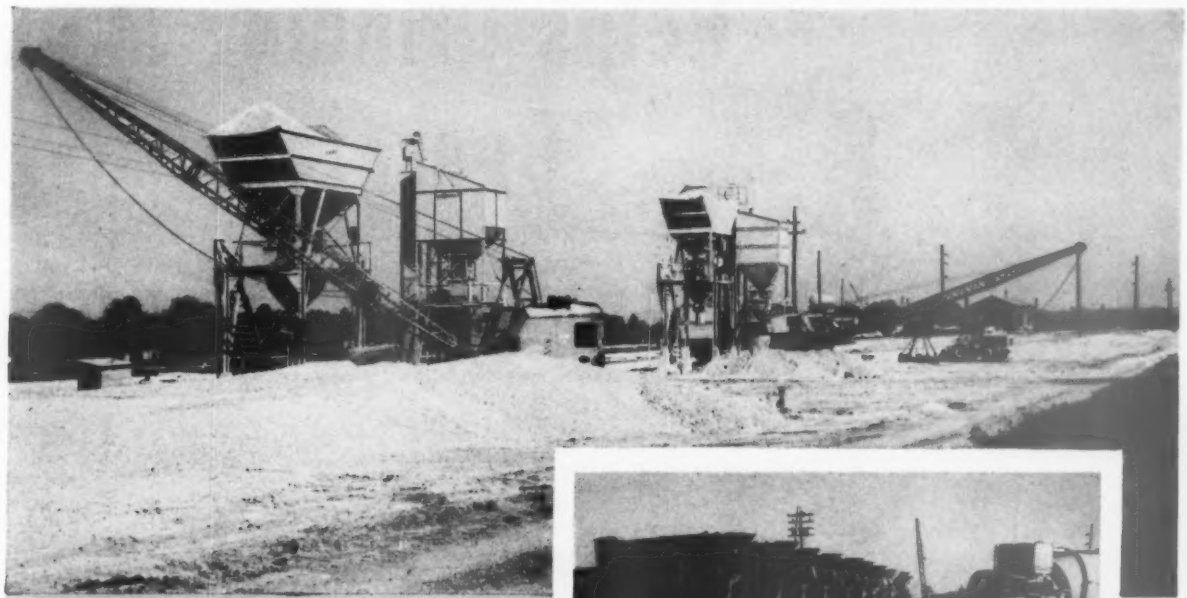
The ultimate in Kiln firing is obtained with a B&W Direct-Firing System using the B&W Type E Pulverizer.



C-203

"More hauls–fewer overhauls with Gulf Quality Lubricants *and* Fuels"

says Albany, Georgia, Contracting Company



Some of the equipment of Grannis and Sloan, Thompson-Street and Wattinger Co., Inc.—satisfied users of Gulf quality products for a number of years. The company is currently at work on the new multi-million dollar warehouse being built at the Albany Marine Depot.

Take stock, as this progressive firm has, of the benefits possible through the use of Gulf quality products and fine service.

Here's what Gulf provides to help you get greater equipment availability, lower maintenance costs, and a smoother over-all operation: (1) Lubricants that give an extra margin of protection against wear; (2) fuels that burn evenly and completely, with fewer engine deposits; (3) expert petroleum engineering counsel.

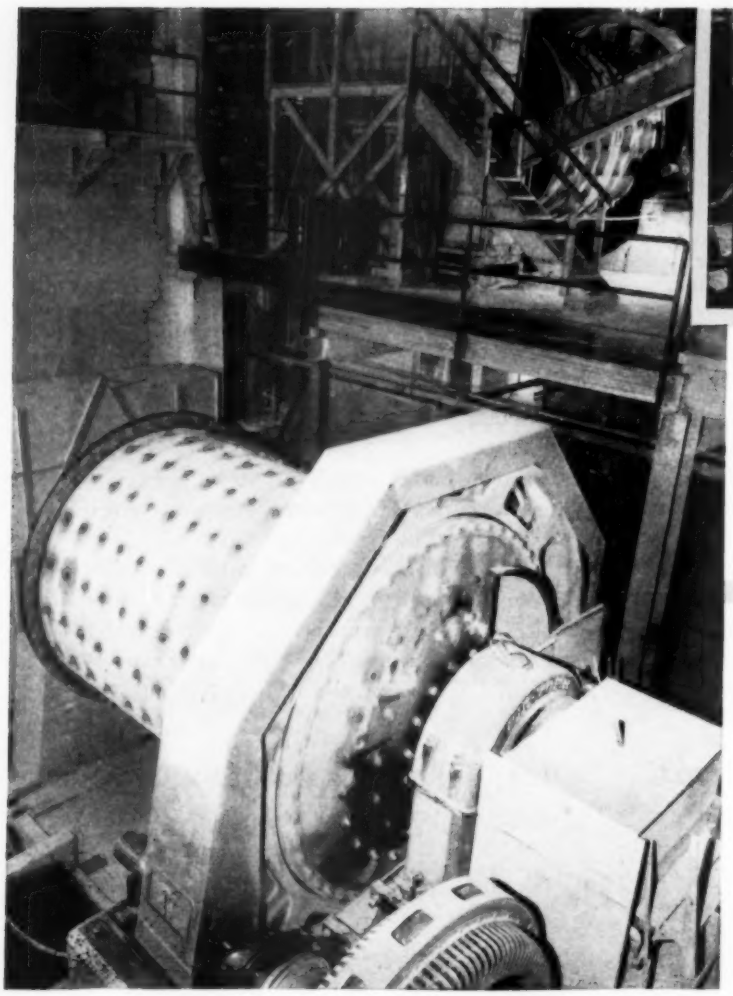
Try Gulf quality products and fine friendly service now. Just call the nearest of more than 1400 Gulf warehouses located in 31 states from Maine to New Mexico, or write to Gulf Oil Corporation, Pittsburgh 30, Pa.

GULF OIL CORPORATION • GULF REFINING COMPANY

GULF

Here's How INDUSTRY'S TOP TECHNICAL Helps Grinding Mill Operators

HELPS PLANT AND CONSULTING ENGINEERS — Here's the way it works. Let's suppose you are building a new concentrator and you want information and recommendations on crushing, grinding, screening, process flow and equipment needed. Allis-Chalmers specialists, familiar with the process problems involved, work with your engineers to provide a solution.



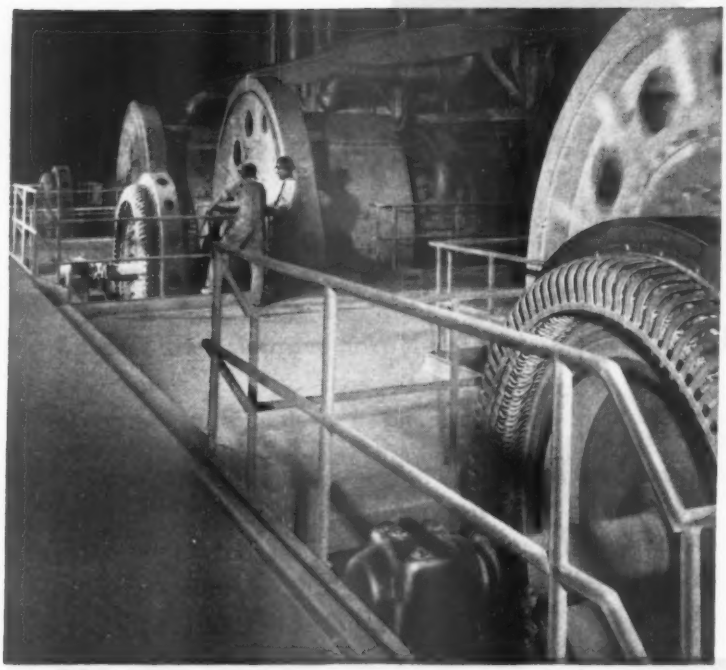
TESTS ORE SAMPLES — Ore samples are sent to the A-C laboratory for crushing, grinding, screening and additional tests to determine the equipment and process best suited to produce the desired end product. This laboratory is one of the best-equipped, best-staffed in the country. View of a section of the pilot grinding mill is shown.

FURNISHES INFORMATION ON PROCESS FLOW AND EQUIPMENT — From lab test information and wide experience gained in solving similar problems, a flow sheet and a list of needed equipment are worked out. In the plant shown here, Allis-Chalmers recommended and furnished the rod and ball mills.

ALLIS-

TEAM

ALLIS-CHALMERS
PROGRESS IN
Grinding Mills



PROVIDES CONTINUOUS SERVICE—When maintenance is necessary, a telephone call will put another A-C team to work on your problem. Complete records are kept on every Allis-Chalmers grinding mill. If parts are needed, these records are checked, and *exact* duplicate parts are speeded to you. Your nearest A-C District Office is always ready to help you. One section of the tremendous inventory of parts stocked at A-C is shown in this photo.

A COMPLETE PLANT OR A SINGLE MACHINE—Because Allis-Chalmers builds many types of equipment . . . crushers, grinding mills, screens, washers, kilns, coolers as well as the electrical power generating equipment, motors and controls, they can furnish a whole plant or a single machine. Allis-Chalmers offers the advantage of undivided responsibility for the complete process and equipment package.

AN ALLIS-CHALMERS TECHNICAL TEAM is always ready to work with your plant or consulting engineers on your grinding or processing problems. To take advantage of their services, call your nearest Allis-Chalmers District Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4292

ALLIS-CHALMERS EQUIPMENT FOR THE MINING AND ROCK PRODUCT INDUSTRIES

Crushers, all types — Vibrating screens, all types — Kilns — Coolers — Washers — Dryers — Smelting equipment

CHALMERS

A-C ALLIS-CHALMERS

*

...is a Johnson-March Engineered Dust Control System!

Wherever dust becomes airborne in a rock crushing plant it causes accident and health hazards, equipment damage and a serious plant and community nuisance.

That's why Johnson-March engineered systems are designed to stop dust at the source . . . at primary and secondary crushers, conveyors, elevators, screens, loading and unloading bins and wherever dust occurs . . . before it becomes airborne.

No ducts, fans or other cumbersome equipment. Easy to install, and economical to operate. Cost averages only 1/10 that of other dust handling systems.

Johnson-March engineers will be glad to analyze your dust problems and recommend a system engineered to your specific requirements.

If you have a stack dust problem, write for information about the Liquid Precipitator "Multiple-Action" Scrubber—the most efficient unit yet developed for removing dust from stack discharged gases.

*Actual unretouched photos taken before and after installation of a Johnson-March system at a large Eastern Rock Crushing Plant.

Johnson March

Dust Control Engineering

DEPT. RP, 1724 CHESTNUT STREET, PHILADELPHIA 3, PA.

No. 1 of a series

How Bemis makes GOOD multiwall bags for you

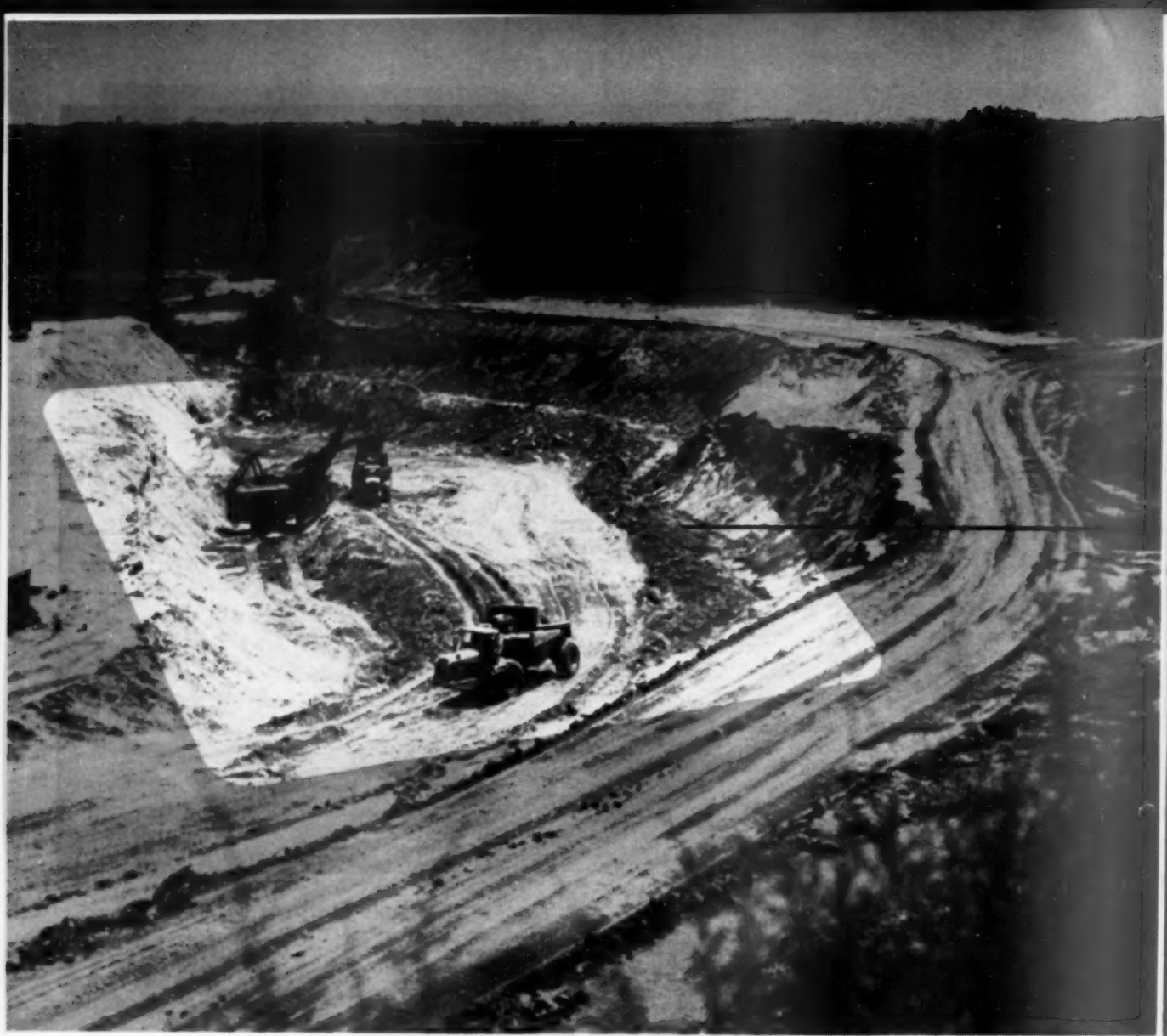
A.R. Ewing, director of the Bemis Paper Control Laboratory, has twenty-nine years' experience in this field. He is shown operating the laboratory's electro-hydraulic tensile tester, one of the many precision devices that make the Bemis laboratory probably the most complete in the country devoted to bag papers.

Use good paper . . . test it . . . prove it!

Bemis sets high standards for the various papers used in making Bemis Multiwall Bags. And we are able to maintain these standards because we buy our paper from a variety of top sources. These multiple sources are the key—if one should fall below par, the others are there to supply our needs. We don't have to take less than the best.

Bemis

General Offices—St. Louis 2, Missouri
Sales Offices in Principal Cities



Tournapull Rear-Dump wastes overburden in mined-out area of pit. 13'8" turn radius, fast spot cut vital seconds off each cycle. Present quarry has been worked 65 years. With 500 acres still to be stripped, Wedron Silica expects to have many more years of profitable operation here.

Tournapull—Trademark Reg. U.S. Pat. Off. R-516-S

Power steer and 3,763 sq. in. braking surface enable operator to safely use Tournapull's high speeds in hilly or restricted quarters. Unique power-proportioning differential keeps hauler moving through soft or slippery going by automatically applying up to 4 times more power to the drive wheel on firmest footing.

Big 12′ x 9½′ bowl, plus low rear-entry, makes ideal loading target. Loads of 12½ yds. take 5 passes of the 2½-yd. dipper. Load time averages 1½ to 2 minutes.

Wedron Silica Co. assigns 100% of stripping to Tournapulls

3 units remove 219 tons of overburden hourly on 3600′ cycles

Wedron Silica Company, Chicago, ships 12,000 to 14,000 tons of sand weekly from their pit at Wedron, Illinois. While the 100′ silica seam is quarried hydraulically, overburden removal was formerly hauled from stripping shovel by crawlers pulling rear-dump wagons. Because track wear and maintenance on crawler tracks was prohibitive, Wedron brought in 2 C Tournapull Rear-Dumps.

These LeTourneau-Westinghouse units proved so economical in their first season's work, the Company has now purchased a 3rd Tournapull Rear-Dump.

3600′ round trip in 6.83 minutes

Loaded by a 2½-yd. Northwest shovel from a typical 80′ layer of overburden, the 3 Rear-Dumps haul 12½ bank yards of clay, gravel, blue clay and sand per load. The overburden, weighing about 2700 lbs. per cu. yd., is taken to mined-out areas of pit. Despite 400′ of 6 to 10% adverse grades out of pit, and about 150 lbs. rolling resistance on the haul road, "C's" complete a 3600′ cycle every 6 minutes 50 seconds. Each machine makes 7 trips per 50-minute hour. The 3 machines combined deliver 162 bank yards or about 219 tons hourly.

With 2300 and 2400 hours on the first machines, and 1100 hours on the newer one, the 186 hp units are still running on original treads. Working a combined total of 5800 hours, each of the machines has shown better than 95% mechanical efficiency to date.

"I think the Tournapulls are 100%, myself," says Foreman A. O. Anderson. "They are very easy on upkeep. It doesn't take over 10 minutes to lubricate them each day."

"They're a lot cleaner and easier to operate than a crawler," adds Operator Oliver Brooks. "They're easy to handle and maneuver. The brakes are fine, too."

If you're interested in increased production or lower hauling costs, it will pay you to investigate Tournapulls. Your LeTourneau-Westinghouse Distributor has job-proved facts and production figures on 9, 18, 35, or 50-ton Rear-Dump models. He will be glad to explain them to you any time.

Recently, Westinghouse Air Brake Company purchased from R. G. LeTourneau, Inc. their earthmoving and related products together with their Peoria, Toccoa, and Australian factories. Adding the high quality standards, precision manufacturing experience, and research facilities of Westinghouse Air Brake to the earthmoving developments of LeTourneau, gives you assurance that the improved line of equipment offered by this strong new company is the finest on the market. Be sure to check LeTourneau-Westinghouse before you buy.

LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

an ACCO product

American Cable "Green Strand" Wire Rope

What Wire Rope Do You Use on Your Carrier Scrapers?

• A complete description of a scraper cable is as long as your arm. But all you have to remember, if you are buying American Cable, is simply: TRU-LAY Streamlined Scraper Cable. And here's what you get, and why—

6 x 25 Flattened Strand—This means six strands of twenty-five wires each wound around triangularly shaped wires in the center of each strand. One flat side of the center wires of each strand faces out providing a relatively flat surface on the strand. The outsides of the six strands together make a smoother surface which gives the rope a much better bearing area against small sheaves and drums.

Independent Wire Rope Core—This adds considerably to the rope's breaking strength, and provides a solid steel core which keeps the rope from pulling down or flattening out on the small sheaves of a carrier scraper.

Lang Lay—When the wires in the strands are laid in the same cross-direction as the strands in the rope, the rope is Lang Lay. This makes the rope last longer because more of the outside wires are exposed to wear. It also makes the rope withstand more bending because of the helix of the wires. The crankiness of Lang Lay is removed by American Cable by preforming.

TRU-LAY Preformed—American Cable's Streamlined Scraper Cable is preformed to make it handle easier and last longer in bending around small sheaves. When wires do break, they stay in place instead of barbing out to slice hands and snag clothing.

Improved Plow Steel—That's what TRU-LAY Preformed is made of. The wire in this all-steel wire rope has an average tensile strength of 260,000 pounds per square inch. Look for the *green strand* which identifies this strong wire rope.

Just ask for TRU-LAY Streamlined Scraper Cable next time and every time you need rope for your carrier scrapers. You can also use it for the blade rope on your bulldozers. Your American Cable distributor stocks it and can give you quick service. Call him today or write our Wilkes-Barre, Pa., office for further information.

ACCO

American Cable Division

AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

plus ACCO Registered Wire Rope Slings

IMPOSSIBLE WITHOUT EXPLOSIVES

Modern explosives, conceived through continuous research, have become an important key to efficiency and economy in mining, quarrying, construction, and petroleum projects. The development of large-scale mining operations at Climax Molybdenum is an example of the mighty power of explosives and their scientific application.

For 40 years, the development, manufacture, and practical application of explosives have been Hercules' business. Our representatives welcome the opportunity to consult with you on blasting problems.

HERCULES POWDER COMPANY

Explosives Department, 946 King St., Wilmington 99, Del.

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Cal.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Cal.

Command the market for low-cost aggregate with the

Cedarapids

Built by IOWA

Commander

TODAY, as never before, you need big volume output *and low-cost production* to command the market for aggregate.

That's what you get with the Cedarapids Commander!

The Commander Plant shown above produced between 300 and 400 tons per hour of 1¼" material with 20% crushing, and the two draglines feeding it couldn't keep it up to full capacity!

Low maintenance and operating costs, the result of Cedarapids-Quality construction and field-experienced design, keep production costs at absolute minimum.

For today's stiff competition, the producer who turns out *more* tons per hour, at *less* cost per ton, is top man on the profit pile.

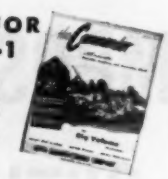
Ask your Cedarapids distributor to show you all the Commander advantages.

HERE'S WHY YOU MAKE MORE PROFIT WITH THE COMMANDER

- **Big 30′ x 22″ Roll Crusher provides the increased secondary crushing capacity required for meeting today's specifications for smaller sizes of crushed aggregate.**
- **Large 48″ x 10′ Horizontal Vibrating Screen gives extra screening capacity to balance the greater roll crusher output.**
- **30″ wide conveyors throughout the plant easily handle the high capacity. The Commander is designed to eliminate any possibility of bottlenecks.**
- **You get this increased capacity *with no increase in maintenance or operating costs!* That's the Commander's profit-benefit to you.**

WRITE TODAY FOR BULLETIN COM-1

It contains complete details of all the features that make the Commander "the plant of the year" for low-cost aggregate production.



IOWA MANUFACTURING COMPANY

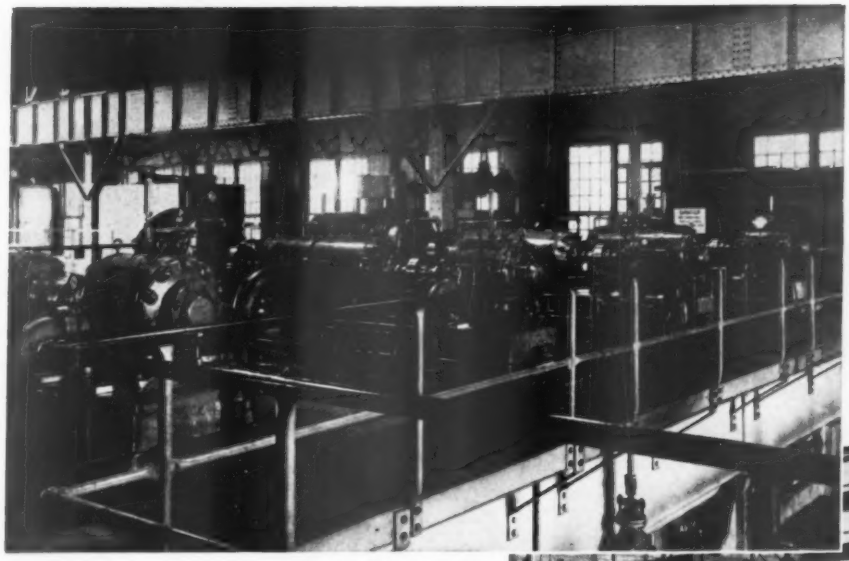
Cedar Rapids, Iowa, U. S. A.

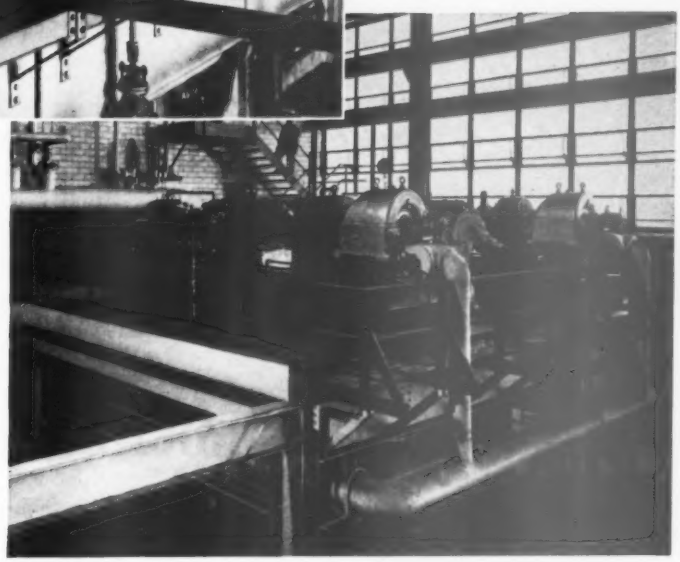
Master Bituminous Mixing Plant

Vibratory Soil Compactor

Motorized Head Pulley

Model G-60—6000-lb. Bituminous Mixing Plant





Views of Fuller Rotaries installed on balconies; overhead, out of the way. Left: Four two-stage; capacity each 1665 c.f.m., 100-lb. psig. Below: Two two-stage; capacity each 1592 c.f.m., 120-lb. psig.

Eliminate heavy, costly foundations with FULLERS

*** simple * compact**

*** direct drive * valveless**

*** vibrationless * pulseless**

If you've never considered the many outstanding advantages of Fuller Rotary Compressors and Vacuum Pumps, now is the time to do so.

Fullers have many unique and beneficial advantages for low cost operation. They can be placed almost anywhere out of the way, because their vibrationless, rotary action permits installation, for example, on a balcony or upper floor of a building . . . no heavy, costly foundations being required. Operated by direct drive, you reduce initial and maintenance costs, as well as transmission losses incident to gear and belt drives.

Because Fuller Rotaries compress without reciprocating motion the air-stream is, in effect, non-pulsating. They're extremely compact for volumes delivered; sizes are available to deliver up to 3300 c.f.m., actual free-air, for pressures to 125 psig., from atmosphere.

Write today to Fuller Company—have one of its compressor engineers recommend the *right* compressor for your operation—one that will give you life-time efficiency and capacity.

Fuller

Pioneers of high efficiency vane-type rotary compressors

FULLER COMPANY
Catasauqua, Pa.

Branch Offices: Chicago • San Francisco • Los Angeles • Seattle • Birmingham

C-239
2156

Scores of GRINDING PROBLEMS

PULVERIZING AND SEPARATING

BLENDING INTIMATE MIXTURES

DISINTEGRATING AERATING AND CLASSIFYING

DRYING AND GRINDING

COOLING AND CONVEYING

REJECTING IMPURITIES

ECONOMICALLY HANDLED *by the Raymond* WHIZZER EQUIPPED IMP MILL

THIS is a compact, self-contained grinding unit for continuous processing of materials from feed hopper to finish bin. The whizzer separator gives close product control. Changes in fineness are made by one simple adjustment while the mill is running.

The wide adaptability of the Raymond *whizzer-type* Imp Mill makes it a highly efficient and dust-free unit for producing the many different types and grades of powdered materials in the non-metallics field.

The Imp Mill delivers a uniform finished product to meet exacting specifications and gives superior results on many unusual operations such as disintegrating and drying various clays, blending pigments, and handling materials which require a cool operating mill.

If you have a special production problem, let Raymond engineers advise you on the most economical type of unit for your purpose.

Many applications described in CATALOG NO. 67 *Write for your copy*

COMBUSTION ENGINEERING, INC.

Raymond Division

1307 NORTH BRANCH ST. CHICAGO 22, ILLINOIS

SALES OFFICES IN PRINCIPAL CITIES

WHERE 2nd Best Won't DO

IT'S A JOB FOR...

Mack Trucks

That's what the Hamilton Gravel Co., prominent and progressive operator of Hamilton, Ohio, proved to its satisfaction soon after purchasing its first Mack six-wheelers only a year ago.

In a business where reputation depends upon reliable service and truck operating costs determine profit margins, Hamilton tested its two Mack units against all other-make trucks in its fleet, with these results:

The other trucks just didn't measure up to the Macks... in work... in payload... in lowest operating cost.

And so, despite higher initial price, Hamilton Gravel Co. bought more Mack six-wheelers.

If, like Hamilton, service and profits are your concern, you can't afford not to own a Mack!

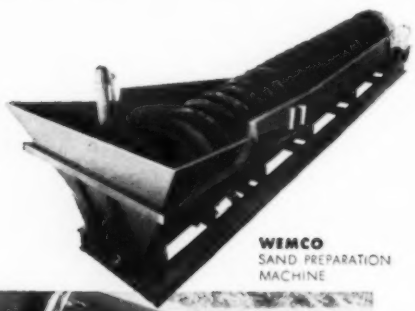
WHEREVER YOU SEE TOUGH JOBS
...THERE IS WHERE YOU SEE MACKS

Only Mack six-wheel trucks offer the advantages of Mack's Balanced-Angle with its exclusive Power-Divider.

Mack Trucks, Empire State Building, New York 1, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

1,790,000 TONS OF SAND

washed at less than 4/100ths of a cent per ton wear cost.



WEMCO
SAND PREPARATION
MACHINE

Performance of these 78" **WEMCO SAND PREPARATION MACHINES** has been as impressive as the enormous size of the pit which furnished the sands. Replacement parts for the two machines have cost less than 4/100ths of a cent per ton of material handled to date, a record far surpassing expectations of the management of this leading western sand and gravel company*.

Simple design costs less

The exceedingly low upkeep cost of **WEMCO SAND PREPARATION MACHINES** results from design principles employing a minimum of moving parts, adequate bearing protection, larger shaft diameter and proper spiral speed as compared with other types of mechanical sand washing equipment.

Quality sands sell for more

Sand that meets specifications is sand that's easiest to sell. **WEMCO SAND PREPARATION MACHINES** have large settling tanks and high sand removal capacity, giving close control over fine fractions. This makes **WEMCO** machines ideally suited to production of specification sands.

And you get greater tonnage!

WEMCO SAND PREPARATION MACHINES combine large **effective** settling area with up to 100% greater sand removal capacity to give maximum production of clean, dry specification sands. Careful control of fine sand retention also adds to greater total recovery of desired sands.

*Name of company furnished upon request

WEMCO
WESTERN MACHINERY COMPANY
760-768 FOLSOM STREET · SAN FRANCISCO 7, CALIFORNIA

Write today for new descriptive Bulletin No. C-1-0-2.

MOBIL-MILLS
COAL SPIRALS
HMS THICKENERS
HMS PUMPS
DENSIFIERS
CONE SEPARATORS
DRUM SEPARATORS

FAGERGREN & STEFFENSEN FLOTATION MACHINES
FAGERGREN LABORATORY UNITS
HYDROSEPARATORS
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SH CLASSIFIERS
THICKENERS
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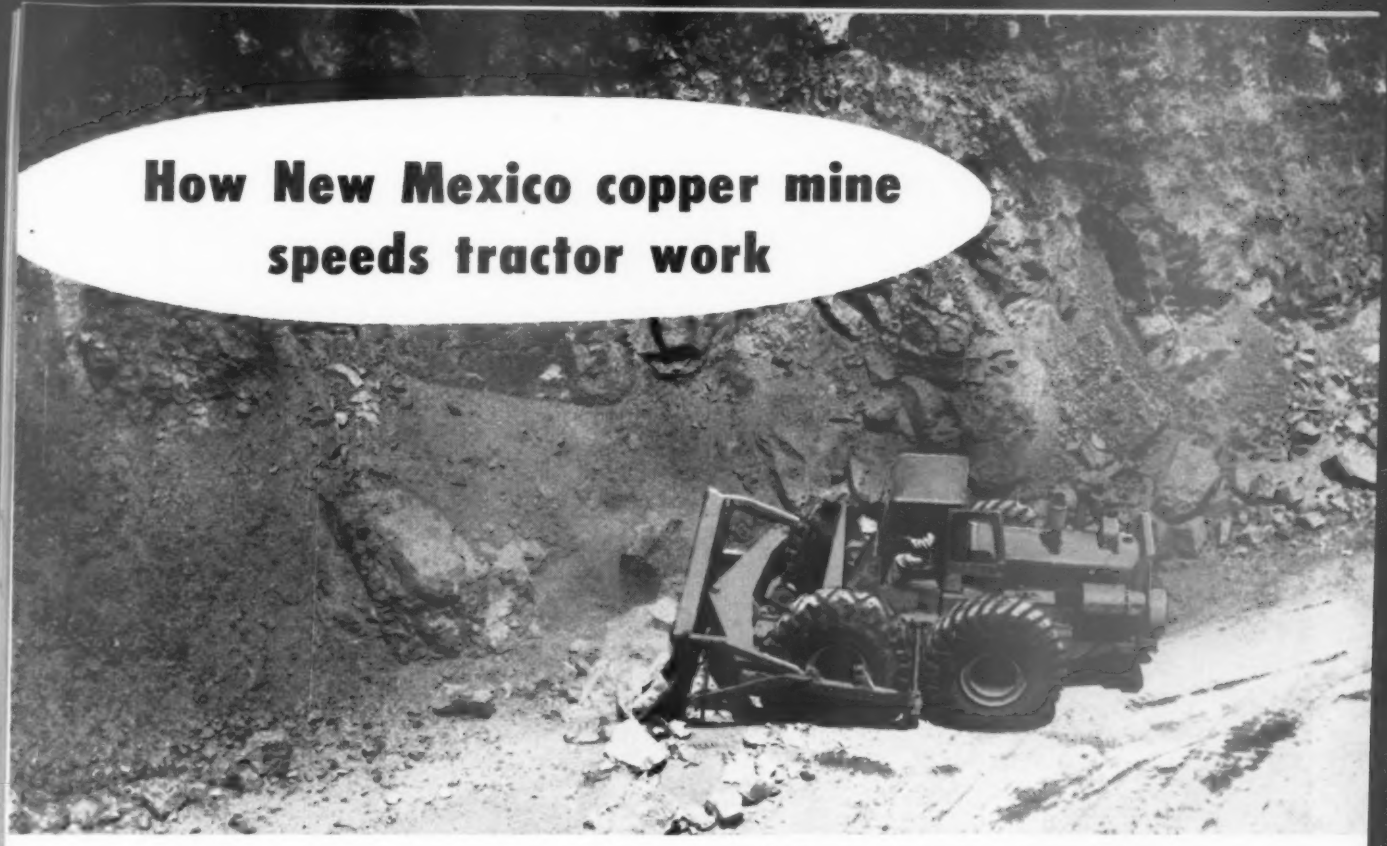
How New Mexico copper mine speeds tractor work



One Tournatractor clears rock from highway.

WITH mostly rock to handle on a 6-day week, year-round basis, a large open-pit copper mine in New Mexico uses 2 Tournatractors as utility tools.

These rubber-tired tractors clean up around large stripping shovels. They also keep haul roads and highways clear of rock, traveling over pavement without damage. When mixed dirt and rock are encountered, one unit pulls a 20-yard scraper; the other, a Rooter. In spare time, Tournatractors do a wide variety of odd jobs, including stockpiling, unloading supplies, pushing railroad cars, etc.

Their chief advantage for this scattered work is their speed. They can go anywhere — across the pit floor or over pavement — at speeds up to 19 mph. With instant-shift transmission and 8 mph reverse, they work 2 to 3 times faster than crawlers on most pushing and pulling jobs.

The other cleans pit floor around shovel.

See for yourself

We will be glad to demonstrate a Tournapull or Tournatractor in your pit. They're better tools than ever since Westinghouse Air Brake's quality manufacturing tradition has been added to LeTourneau's earthmoving leadership.

Tournatractor — Trademark
Tournapull, Rooter — Trademark Reg. U. S. Pat. Off. T-472-M-b

Here's what other pit owners say about TOURNATRACTOR:

Texas Iron Mine — "Where speed, mobility and power are essential, it's the best machine I've ever run into."

Illinois Coal Mine — "There's not a crawler-type machine made that will move the amount of dirt Tournatractor will."

Arkansas Bauxite Mine — "Serves us well. Mobility lets it easily handle our large number of scattered small jobs."

Ohio Cement Plant — "Moves as much shale in ½-day as crawler can in full day . . . and has saved moving costs."

Kentucky Coal Mine — "Does about twice the work of a crawler on straight dozing or clearing the coal seam."

LeTourneau-Westinghouse Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

6 MANITOWOCS Serve H. E. FLETCHER CO., Granite Quarry

ONE GOOD MACHINE deserves another—and so it has been at the H. E. FLETCHER CO., one of the nation's leading quarries. Since buying their first Manitowoc, 5 more went on the job at their huge West Chelmsford, Mass. quarry—3 Model 3900's, 1 Model 3000 and 1 Model 2000, where they have been replacing stationary derricks.

Equipped with 90' booms, they handle everything that comes their way—simply, accurately, safely. Stone breakage is held to a minimum, because of the precise control of a Manitowoc. Ready maneuverability permits them to be used all over the quarry and surrounding area.

If you've never tried a Manitowoc, you'll be amazed at the difference in performance a Manitowoc will provide—a difference that can be seen and measured in faster operating cycles; greater productivity; less maintenance and down time; and far easier operation.

And remember, in a Manitowoc you can get the TORQUE CONVERTER, pioneered by Manitowoc for shovel operation—plus many other exclusive features and advantages no other machine offers. No wonder most everyone is switching to mighty Manitowocs.

MANITOWOC ENGINEERING CORP., MANITOWOC, WIS.

MANITOWOC

SHOVELS 1-5 YD. Speedcrane CRANES 18-100 TON

Operators Report . . .

"INCREASED PUMPING LIFE 3 TIMES"

"SAVES US $300 PER MONTH IN MAINTENANCE"

ALLIS-CHALMERS
Solids Handling
PUMP

Long Life...Low Cost Operation

Proved by Service Records

In many operations, where other pumps had a life of two or three weeks before they required service, Allis-Chalmers solids handling pumps piled up an impressive record. Typical service records show: 8 months, no loss of capacity — 9 months, 2 and 3 shifts, new impeller — 10 months' service, no parts replaced. These are just a few examples.

Allis-Chalmers solids handling pumps have established this fine record because they are made of a special hard alloy . . . because extra wear is built into impeller and wear plate by the use of *Ni-Hard** . . . because they are built with extra strong parts and extra thickness of metal in critical parts . . . because they are application engineered by men who know solids handling equipment problems.

When replacement finally does become necessary, A-C solids handling pump is easy to tear down and reassemble. Wearing parts are separated into easy-to-handle units. Piping need not be disturbed.

A-4323

ONLY 5 WEARING PARTS

Shaft sleeve
Impeller
Casing
Two wear plates

ALL EASY TO HANDLE AND EASY TO REPLACE.

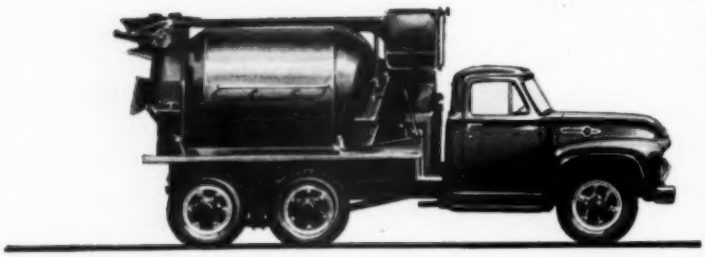
* 3 largest sizes special hard alloy throughout. 6 sizes all *Ni-Hard* available.

For complete information about Allis-Chalmers solids handling pumps, call your local A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for bulletin 0886381.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

ANOTHER WAY YOU SAVE WITH FORD *TRIPLE ECONOMY*

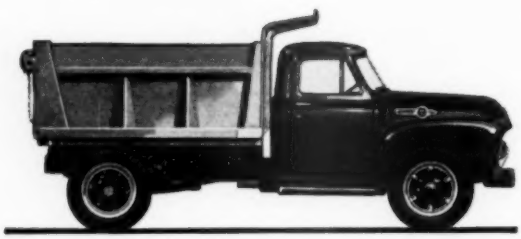


2 New Tandem Axle Big Jobs . . . up to 3800 lbs. more payload than other make 6-wheelers

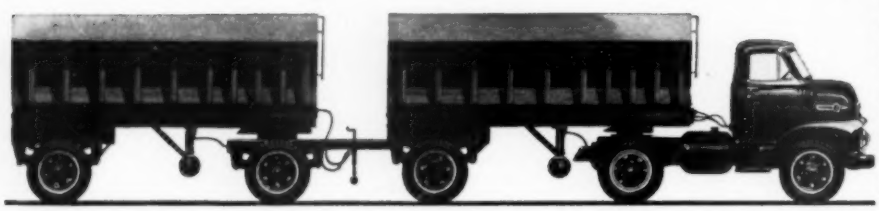
Brand new Ford factory-built T-700 and T-800 six-wheelers rated for 27,000 lbs. and 40,000 lbs. GVW, up to 60,000 lbs. GCW. Powered by LOW-FRICTION V-8's—138-h.p. *Power King* and 152-h.p. *Cargo King* (T-700), 170-h.p. *Cargo King* (T-800).

4 New Conventional Models . . . up to 27,000 lbs. GVW —55,000 lbs. GCW

New Ford Series F-700, F-750, F-800, F-900 offer body and payload capacities up to 20,117 lbs. Three new LOW-FRICTION V-8's give you gas-saving power, from 138- to 170-h.p., concentrated in 256 to 317 cubic inches displacement.



4 New Cab Forwards . . . up to 2500 lbs. more payload



Ford's giant new Cab Forwards, C-700, C-750, C-800, C-900, haul 35-ft. trailers within the legal limit in all states. Rated up to 27,000 lbs. GVW, up to 55,000 lbs. GCW. C-900 handles up to 2500 lbs. more payload than other make cab forwards with 55,000 lbs. GCW.

'54 Fords go big on BIG JOBS!

Ten series in Ford's expanded line of new extra heavy duty trucks. New V-8 power up to 170-h.p.! New Master-Guide Power Steering! New money-saving capacities give you another way to save with Ford Triple Economy.

Now there's a Ford Truck to handle your toughest, heaviest hauling and do it with economy that's new to the extra-heavy-duty field.

New LOW-FRICTION, Overhead-Valve V-8's deliver as much as 44% more power per cubic inch than other truck engines in their class. The fewer cubic inches an engine has, the less gas it usually needs. New Short-Stroke design cuts friction, increases engine life.

New *Master-Guide* Power Steering is standard on T-Series with *Cargo King* engines, optional at worthwhile extra cost on F-Series with *Cargo King* engines. It cuts steering effort up to 75%! Ford's new 3-man *Driverized* Cabs and controls provide comfort and driving ease to help the driver do a better job, faster and with less effort.

For new slants on heavy duty truck economy, call your Ford Dealer *today*, or write: Ford Division, Ford Motor Co., Dept. T-13, Box 658, Dearborn, Mich.

SAVE WITH *ALL THREE!*

1. New Gas-Saving Power
2. New Driver-Saving Ease
3. New Money-Saving Capacities

FORD *TRIPLE ECONOMY* TRUCKS

MORE TRUCK FOR YOUR MONEY!

Stays out of the shop, stays on the job!

LE ROI TRANSO
Unitized design simplifies maintenance
4-wheel drive traction reduces engine strain and tire wear
Torque converter provides smooth flow of power... cushions shock

Le Roi-Transo TLF-150 Front-End Loader

YOUR first look at a Le Roi-Transo TLF-150 tells you it's got guts — guts aplenty! And Le Roi-Transo engineering is the reason.

Because of Le Roi-Transo engineering, your TLF-150 is seldom tied up in the shop. Because of Le Roi-Transo engineering, you load faster, travel faster, and dump faster — in sand, mud, snow, or rocky terrain.

Le Roi-Transo design assures you of less downtime these and other ways:

- Engine, transmission, clutches, axle assembly, and torque converter are grouped compactly and are easy to get at. You save maintenance, time and labor. For example, it takes *less than an hour* to replace the spring-loaded clutch.
- Patented "bucket-rocking action" helps you get a full bucket load within seconds, without tire-spin or undue strain on the loader.
- Torque converter assures smooth flow of power to all four wheels — gives you sure-footed traction, reduces engine strain and tire wear.

It's design details like these that help Le Roi-Transo TLF-150 save important time and money for you.

Have your Le Roi-Transo distributor arrange a demonstration, so you can see *all* the reasons why it pays to use a Le Roi-Transo TLF-150 on your material-handling jobs. TD-15

Note how compact arrangement of transmission, clutches, and torque converter puts transfer case conveniently at rear, so by merely removing the rear grill you can replace transmission clutch in less than 60 min.
TRANSO
DIVISION
LE ROI

LE ROI COMPANY

A Subsidiary of Westinghouse Air Brake Co.
TRANSO DIVISION
MILWAUKEE 14, WISCONSIN
Plants: Milwaukee • Cleveland — Greenwich — Dunkirk, Ohio • Coldwater, Mich.

LIMA Type 44 ANSWERS DEMAND for One yard shovel and 25 ton crane

(AVAILABLE WITH CRAWLER, WHEEL OR TRUCK MOUNTING)

To meet the need for a 25 ton crane and 1 cubic yard shovel, Baldwin-Lima-Hamilton Corporation, is now producing the LIMA Type 44. As a shovel, it is equipped with 20 ft. boom and 15 ft. dipper handle. This latest addition, fills an important spot in the LIMA line, between the famous Paymaster (17½ ton crane—¾ yard shovel) and model 604 (35 ton crane—1½ yard shovel).

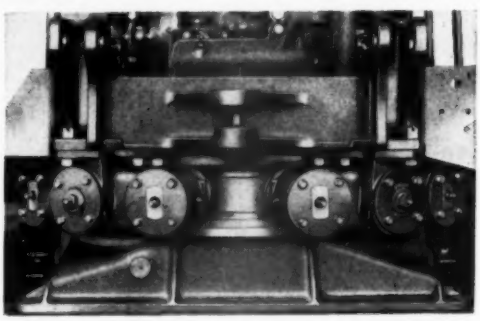
Like its smaller brother, (Paymaster, Type 34), the LIMA Type 44 is available, with either crawler or rubber mountings. Wider, longer crawlers for greater stability and double sets of front cone rollers, to distribute the load more equally over a wider area, are some of the major design features.

For your copy of our Type 44 bulletin, please contact your nearby LIMA distributor, or write to Construction Equipment Division, Baldwin-Lima-Hamilton Corp., Lima, Ohio.

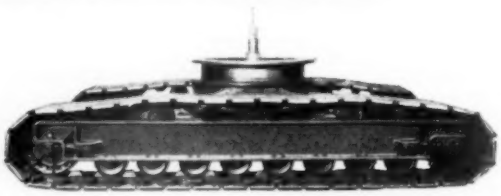
COMPARE!

No other machine gives you as much as LIMA!

1. All gears, smaller parts and shafts which are subject to extra wear, are flame or induction hardened for longer life.
2. Main machinery is placed well back of center of rotation, to eliminate excess counterweight.
3. Anti-friction bearings, used at all important bearing points, reduce destructive friction, fuel consumption and lubrication requirements.
4. Big capacity drums and sheaves, lengthen cable life by reducing the need for double wrapping and sharp bends in cable.
5. Propel and swing gears and power take-off, are enclosed in a sealed oil bath for dirt elimination and smoother, quieter operation.
6. Torque converter (optional), automatically adjusts speed to load requirements, minimizing shock loading, making performance smoother and faster.
7. COMPARE and you'll specify LIMA for shovels, (¾ cu. yd. to 6 cu. yds.), cranes (to 110 tons) and draglines (variable).



The conical rollers are the hook type, four in front and two in the rear. The four front rollers are arranged in pairs and each pair is mounted in an equalizer frame.



An extra long Crawler (15'-0" long, 10'-8" wide), is available for work requiring greater stability.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

LIMA

SHOVELS • CRANES
DRAGLINES • PULLSHOVELS

BALDWIN BLH LIMA-HAMILTON

Construction Equipment Division

BALDWIN-LIMA-HAMILTON CORPORATION
Construction Equipment Division
LIMA, OHIO, U.S.A.

roadways made easy

PHOTO COURTESY HETHERINGTON AND BERNER INC., INDIANAPOLIS, INDIANA

Chrysler *Power helps keep America rolling... at less cost*

This mobile mixer-paver replaces costly man-hours with economical horsepower. In one continuous operation the unit takes in sand, gravel, stone or other road surfacing materials, mixes them in with a binder ingredient—all in predetermined proportions—and spreads the mixture onto the roadbed, to whatever depth best meets grade and crown requirements. Materials to be mixed may be fed to the unit from trucks, as in this case, or picked up from windrows with a loader attachment. The entire operation requires the services of three, possibly four, men.

The Hetherington and Berner Moto-Paver turns out up to 120 tons of mix per hour for resurfacing jobs. Paving width is adjustable from 8½ to 12 feet, depths to 7 inches. Paving speeds start at two feet per minute. Road speeds up to twenty-five miles per hour enable the equipment to carry itself from one job to another.

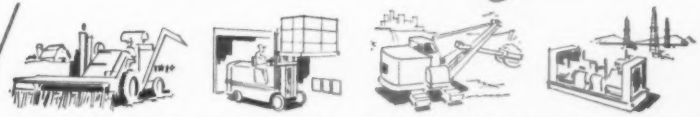
Two Chrysler Industrial Engines power this equipment. Travel components are driven by our Model 8 Engine whose 250 cubic inch displacement, together with Chrysler gyrol Fluid Coupling, provides power with flexibility of operation. A Model 14, powerful 331 cubic inch displacement engine, drives mixer, conveyor, spreader and pumps.

If your equipment requires power within our 230 to 413 cubic inch displacement range, engines that will operate equally well on gasoline, natural or L-P gas fuels, engines ideally suited to power take-off, see a Chrysler Industrial Engine Dealer. He can *power-fit your equipment for best performance in the field.*

Remember, too, that Chrysler Power is not expensive. Production-line methods adapted to specialized industrial engine building provide a custom-built engine at mass-production prices. If you prefer, write: ***Department 125, Industrial Engine Division, Trenton, Michigan.***

CHRYSLER *Industrial Engines*

HORSEPOWER WITH A PEDIGREE

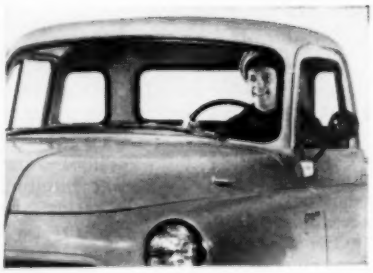


AGRICULTURE • INDUSTRY • CONSTRUCTION • OIL FIELDS

"Our new Dodge truck is a better deal for me and for my boss, too!"

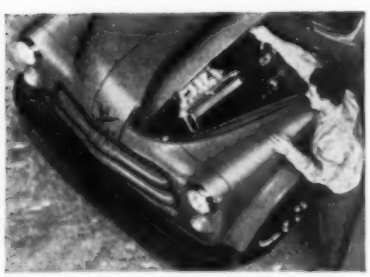
Our new Dodge "*Job-Rated*" trucks have proved a better deal in handling ease, visibility, comfort and power. You, too, can save time and money, work and effort with these great new trucks. Find out today why Dodge means a better deal all around!

YOU GET—A Better Deal In Steering! Sharp 39° turning angle and short wheelbase design make Dodge the sharpest turning trucks on the road. That saves you *time!*



YOU GET—A Better Deal In Seeing! Big 951 sq. in. windshield of Dodge cab is largest of any popular truck. All-around visibility is tops, too, for safer driving.

YOU GET—A Better Deal In Sitting! The 16-inch-high Dodge seat is deep and comfortable enough to be in your living room! Plus easy-to-reach controls and dispatch box.



YOU GET—A Better Deal In Power! You save on maintenance because every Dodge engine . . . V-8 or Six . . . has such long-life features as exhaust valve seat inserts, chrome-plated top piston rings and positive-pressure lubrication.

New Dodge trucks give A BETTER DEAL FOR THE MAN AT THE WHEEL—and a better deal for the man who pays the bills. Test-drive and learn how a Dodge makes driving easier and does more work in less time. Give your Dodge dealer a call. He'll be glad to show you.

DODGE
"Job-Rated" TRUCKS

TUNE IN: "Break the Bank," Sunday TV—"The Roy Rogers Show," Thursday radio—"Make Room for Daddy," Tuesday TV.

BUCYRUS ERIE

FULLY ELECTRIC dragline with individual hoist and drag motors for positive control, quick change from hoist to drag. No operating clutches or brakes.

TWIN DRAG ropes for stable bucket action and fast filling.

WARD LEONARD VARIABLE VOLTAGE CONTROL for rapid acceleration and deceleration.

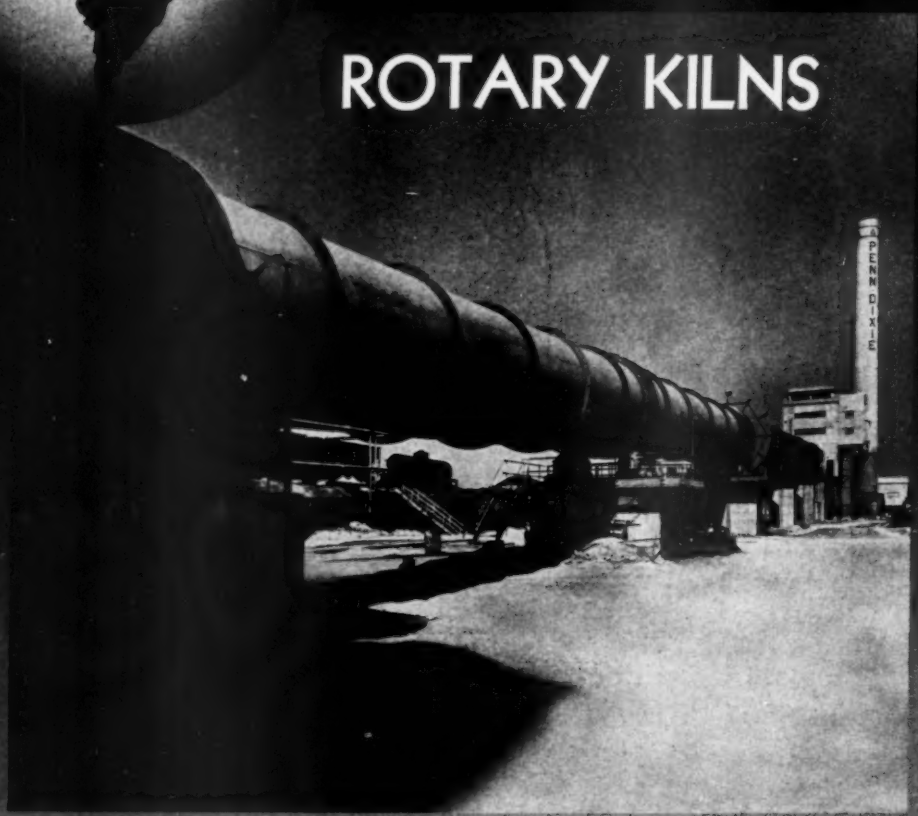
BIG CAPACITY, long reach—8-yd. bucket with 215-ft. boom, 10-yd. bucket with 195-ft. boom, 12-yd. bucket with 175-ft. boom.

FOR SUSTAINED HIGH OUTPUT at proved low cost per yard . . . it will pay you to investigate the Bucyrus-Erie 500-W. 25L53

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

SMIDTH

ROTARY KILNS



Longest Rotary Kiln in the Western Hemisphere.
500 feet long, 12 feet in diameter.

Designed and Furnished by F. L. Smidth & Co.
for Penn-Dixie at Kingsport, Tenn.

For Smidth Machinery apply to:

F. L. Smidth & Co., A/S Vestergade 33, Copenhagen K, Denmark	**F. L. Smidth & Co.** 11 West 42nd Street New York 36, N. Y.	**F. L. Smidth & Co., Ltd.,** 105, Piccadilly, London, W. 1, England
F. L. Smidth & Cie France 80 Rue Taitbout Paris (9e) France	**F. L. Smidth & Co. of Canada, Ltd.** 11 West 42nd Street New York 36, N. Y.	**F. L. Smidth & Co. (Bombay) Ltd.** 42 Queen's Road Bombay, India

WHAT'S HAPPENING

In Other Fields of Interest to Rock Products Industry

May, 1954

Recovery of a large share of the nation's manganese requirements from steel plant slag may be commercially feasible, according to a recent report in Chemical and Engineering News. A 400-ton demonstration plant has recently been completed at Pittston, Penn. Its operation involves smelting basic open-hearth slag to produce a low-manganese alloy containing 3 to 4 percent phosphorus, selectively oxidizing resulting spiegel in a basic Bessemer converter to produce a cinder containing 50 to 60 percent manganese, oxidizing remaining metal with lime to produce scrap steel and tricalcium (for possible fertilizer use), and finally smelting cinder from second step to form 80 percent ferromanganese. The general process is not new, having been tried unsuccessfully in both this country and Germany, but it is hoped that new techniques will overcome the former troubles. If successful, it is estimated that 38 to 68 percent of the steel industry's ferromanganese requirements might be salvaged from available waste steel slags by this procedure.

* * * * * * * * * *

Heavy construction awards, nationally, totaled $2,485,558,000 during the first 12 weeks of 1954, a decrease of 33 percent from the $3,699,464,000 for the corresponding period of 1953, as reported by Engineering News-Record. However, the uptrend in volume during the last five weeks of the period narrowed the 46 percent deficit at the end of the first seven weeks of 1954, compared to 1953. Most of the gap in total volume between 1954 and 1953 was said to be due to unusually large contracts let in 1953 for industrial building and private housing.

* * * * * * * * * *

A bill was recently introduced in the Senate which would authorize an annual appropriation of $1,002,000,000 in federal funds for aid in highway improvement for the fiscal years of 1956 and 1957. For the federal-aid systems, interstate, primary, secondary and urban, the proposed legislation would authorize $835 million in annual federal funds, as compared with current authorizations of $575 million per year. The net effect of this measure, insofar as the federal-aid systems are concerned, where a federal-state matching basis is employed, would be to increase by more than one-half billion dollars per year the funds now being invested in new highway construction.

* * * * * * * * * *

A new lightweight ceramic building block has been developed at Armour Research Foundation. The block is made of ceramic clay and consists of 90 percent bloated clay, bonded with fused clay. It is said to provide high insulation and a load-bearing strength of 1000 p.s.i. The block can be produced in a variety of colors ranging from buff to dark maroon and, because of their fine-pore structure, reportedly can be cut or trimmed easily. The new block was perfected in a project sponsored by the Arabian American Oil Co. which expects it to solve the problem of providing low-cost housing in Saudi Arabia.

* * * * * * * * * *

American railroads set new records in 1953 in several categories, according to Missouri Pacific Lines, which reported that more than $1.2 billion were spent during the year on new equipment, plant and facilities, making the sixth consecutive year in which railroad capital investment has topped the billion-dollar mark. Equipment expenditures continued to highlight capital expenditures, with over 2000 new locomotive units, mostly diesel-electrics, and 80,000 new freight cars being installed during the year.

* * * * * * * * * *

Estimated net income of railroads, for the first ten months of 1953, after interest and rentals, was listed at $740,000,000, compared with a net income of $630,000,000, for the corresponding period of 1952. In the 12 months ended October 31, 1953, the rate of return reportedly averaged 4.45 percent.

WHAT'S HAPPENING

The Commissioner of the Federal Housing Administration recently presented the Secretary of the Treasury a check for $16,500,000, which completes payment to the treasury of $85,900,000. The check represents the final installment on the repayment in full of $65,500,000 advanced by the U. S. Treasury Department to provide operating capital and establish the various insurance funds, plus interest in the amount of $20,400,000, at the rate of 2¼ percent. Insurance written to date by the F.H.A. under all of its programs reportedly is in excess of $30 billion. Mortgages have been insured on over 3,300,000 homes and on housing projects with over 640,000 units, besides 16,600,000 loans financing repairs and improvements to properties. Of the aggregate insurance written, $17,500,000,000 is estimated to be outstanding at this time.

* * * * * * * * * *

According to a recent report in the New York Herald Tribune, an unprecedented building boom may result in making 1954 one of the best business years on record. Combined construction figures for January and February are reported to be the highest in all history, exceeding $2,100,000,000. When the multiplying factor of four is used, as is customary when estimating the resultant purchasing power, the months of January and February represent about $9,000,000,000 in purchasing power, or a 10 percent gain over the 1953 period. Increased construction activity will mean not only increased demand for building materials, but also increased employment, and increased demand for home furnishings, and for plant, building, office and other equipment.

* * * * * * * * * *

Announcement was recently made of the development of a wire-reinforced plywood, which reportedly offers double the structural strength of standard plywood and, although still in the experimental stage, could become a possible competitor of concrete and other building materials. Colorado Fuel & Iron Co. has been working with the inventor to perfect manufacturing processes. The reinforcing element, a black iron woven mesh cloth of 23½ gauge, with 16 holes per sq. in., is glued between the plywood's two sheets of veneer. Tests conducted on the product showed that standard ¼-in. panels break down under 1140 p.s.i., but reinforced panels of the same thickness reportedly held up beyond 4000 p.s.i. The material can be sawed with the use of power saws equipped with carbide-tipped blades.

* * * * * * * * * *

The $2,000,000 cargo ship, the Harry Lundeberg, owned by Gypsum Carrier, Inc., subsidiary of Kaiser Gypsum Co. and Permanente Cement Co., was recently shipwrecked. No casualties were reported, but the 7160-ton ship and its 10,000-ton load of gypsum ore were said to be a total loss. The ship had been loaded at Cape San Marcos Island, in the Gulf of California, where the company owns large gypsum deposits, and was rounding Cape San Lucas at the tip of lower California when it hit a shoal.

* * * * * * * * * *

The auction of three truck loads of agricultural limestone recently netted $90 for the Butler, Mo., "March of Dimes" polio fund. The idea was advanced by Fuller Lime Co. which donated the three loads of agstone. The event reportedly drew quite a crowd and the bidding was brisk until the premium price of $30 per load was reached.

* * * * * * * * * *

Canadian cement prices reportedly may be cut, reflecting increasing competition from European producers. The price action is not expected to be uniform, however, depending on freight and on degree of competition in different parts of the country.

* * * * * * * * * *

Mixed, powdered raw materials—magnesia, alumina, silica, potash, feldspar, and potassium silica fluoride—are being used to produce a pure, clear heat-stable synthetic mica, as recently reported in Chemical and Engineering News. The materials are dumped into a metal shell containing a graphite electrode network. Local heating from a graphite resistor is used initially to melt material between the vertical electrodes. After a few hours of operation, the resistor burns out and passage of current through the molten pool of material itself furnishes heat for continued melting. High volume use for this synthetic mica is expected to be in the form of a reconstituted sheet made by settling ground material on a continuous belt in a way similar to the papermaking process. The resulting product is said to have properties similar to that of natural mica and has potential electrical uses. Use in electron tubes operating at high temperatures may also be possible.

THE EDITORS

(Inset) Harry Deshler, President Superior Building Products, Inc. Plant is housed in a 50' x 162' concrete block building, produces 440-8 inch equivalents per hour.

Stronger Blocks made without steam

THERMOBLOC Direct Fired Heater Makes

New Process More Efficient and More Economical

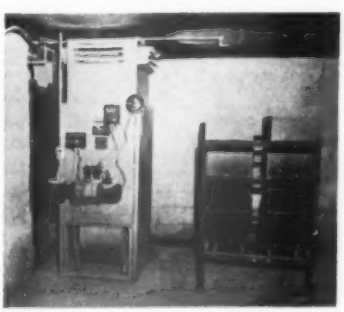
The Superior Building Products, Inc. of Toledo, Ohio, makes no secret of its production of higher tensile blocks at less cost.

Using heated air from a Thermobloc oil-fired heater, augmented by a fine water spray, the Company's method has resulted in faster, more economical curing with unloading breakage being practically eliminated.

A seven-day test on an 8-in. heavyweight block shows a strength of 864 psi gross area. A fourteen-day test of the same block shows a strength of 1405 psi.

No live steam is used in the process. Curing is accomplished through heated air furnished by a Thermobloc Heater. The compact, self-contained unit heats two kilns while occupying less space than is used by one block rack! Heat output is 200,000 btu. Air is circulated at rate of 2400 cfm. Fuel consumption averages an insignificant 1.75 gal. of No. 2 oil an hour.

For complete details on efficient, economical curing of concrete blocks, use the coupon for interesting booklet.



Model 200 Thermobloc. Unit heats two kilns. Note compactness.

THERMOBLOC ADVANTAGES FOR CURING CONCRETE BLOCKS

- Helps make stronger, more salable blocks.
- Insignificant unloading breakage.
- Low initial investment—Eliminates expensive boiler, pipe lines and installation.
- High heat efficiency—87% efficient in the above installation.
- Needs no attendant—Automatic temperature controls.
- Low operating cost. Economical clean fuel.

THERMOBLOC DIVISION

PRAT-DANIEL CORPORATION

Manufacturers of P-D Power Plant Equipment

15-25 Meadow Street South Norwalk, Conn.

Loading a 2-ton truck. Two such trucks deliver blocks within a 20-mile radius of the plant. Loading and transportation breakage is practically nil.

THERMOBLOC DIVISION
Prat-Daniel Corp.
15-25 Meadow Street, South Norwalk, Conn.

Gentlemen:

Please send me your booklet "Curing Concrete Block the Thermobloc Way."

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____ CITY_____ STATE_____

How to Move MORE

New . . . New . . . New . . . New . . . New . . . New

with a MICHIGAN*...

in 3/4 yard bites!

. New . . . New

CLARK EQUIPMENT COMPANY
presents the

MICHIGAN Series "24"

Model T-24 Truck, 6 x 4 and 6 x 6; Model C-24 Crawler Shovel, Clamshell, Crane, Dragline, Hoe

14 Reasons Why — the MICHIGAN Series "24" Is Your Best Buy In '54

Full Vision Cab—new, stylized; all-around and overhead vision—3604 sq. in. glass; comfortable, quiet

Air Controls—clutches actuated by famous MICHIGAN* Air Controls

Power Clutches—single plate, double-disc, multiple-segment—air operated

Primary Drive—power transmitted through two sets spiral bevel gears running in oil

Shafts and Drums—hoist and crowd drums ball bearing-mounted on splined alloy steel anti-friction bearing-mounted shafts

Swing Brake — air operated; standard equipment

Circle Gear Casting—large diameter double-flange one-piece steel casting

Hook Rollers—six 7½" diameter, tapered, adjustable; ball-bearing mounted

Cast Turntable — machinery deck with boom hinge pin bracket and hook roller brackets—single steel casting

Big Brakes—powerful hoist and crowd brakes, 30" diameter

Worm Gear Boom Hoist—independent high speed hoist with automatic safety brake—standard

Removable Counterweight — power-handled for easy, quick removal or assembly

Truck Chassis—heavy duty: big engine, transmission, axles; deep section alloy steel frame, cross-braced, welded; rear and center outriggers standard

Crawler Base—one-piece cast steel carbody and circle gear; spring loaded safety brakes; 24" tracks standard

You'll find the MICHIGAN Fact-Folio handy and helpful; contains full specifications, an interesting book "Get More Yardage Through Air Power," and numerous action photos. The coupon will bring yours promptly.

*A Trademark of Clark Equipment Company

CLARK EQUIPMENT **Construction Machinery Division**

CLARK EQUIPMENT COMPANY
Construction Machinery Division
452 Second Street, Benton Harbor, Michigan

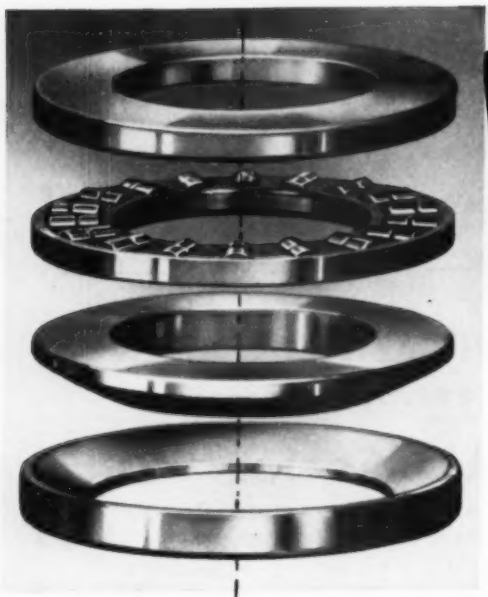
Please send the MICHIGAN "24" Fact-Folio

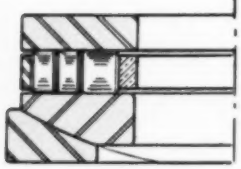
Name_____ Title_____

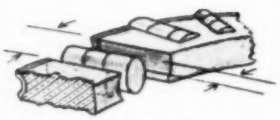
Firm_____

Address_____

City_____ Zone_____ State_____







PARALLELISM

ACCURATE PARALLELISM between the rollers and the matched thrust plates is repeated in the parallelism between the separator slots and the rollers themselves—all adding up to quietness, equalized wear and longer life.

THRUST
RADIAL

RIGHT ANGLE
Roller Ends, precisely square to avoid end-rub, oscillation and side-shock.

- **RIGHT ANGLE**
  Bearing Surfaces with parallelism that results in unwavering right-line rolling.
- **RIGHT ANGLE**
  Separator Slots accurately machined to prevent roller skew, slide and uneven wear.

Held to extremely close limits of parallelism, every roller—every race—every thrust plate in a Rollway Bearing is an engineering masterpiece of matched precision and right-angle trueness. As a result, friction losses are low—load capacity and service life high.

Rollway Radial and Thrust Bearings offer the widest selection in types and sizes, available for quick replacement through authorized distributors. Consult your classified phone directory under BEARINGS.

Our engineers are available without cost or obligation to assist you in selecting the correct Rollway Bearing for your needs. Call your nearest Rollway sales office.

SALES OFFICES

Syracuse	Cleveland
Boston	Milwaukee
Chicago	Seattle
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ROLLWAY
BEARINGS

Complete Line of Radial and Thrust Cylindrical Roller Bearings

TRACTOR SHOVELS CUT HANDLING TIME AND LABOR IN IOWA ROCK QUARRY

Dig, haul and load to crusher . . . average two tons a minute in a nine-hour day

The 72-hp. HD-9G has ample power to dig into tough rock piles and come out with a big payload every time. Wide bucket permits quick loading and safe handling of large rock. These dependable tractors are on the job nine hours a day, six days a week.

Production costs are being cut in a large rock quarry in Iowa, by two Allis-Chalmers HD-9G Tractor Shovels, and their use is bringing additional efficiency to the entire operation.

These two tractors, equipped with standard two-yard buckets, load rock directly from quarry face to rock crusher, eliminating the need of continually moving crusher. What's more, the speed of these two units enables the crusher to load out 135 eight-ton trucks a day.

The excellent performance of the two Allis-Chalmers Tractor Shovels has attracted the attention of local contractors and county officials. Many have stopped by especially to see these two machines at work.

Let your Allis-Chalmers dealer show *you* the HD-9G at work. See how it can bring new efficiency to your operation.

With the Tractor Shovel method, rock is handled only once from quarry to crusher. Crusher is able to load out 135 eight-ton trucks a day when fed by these fast-working Allis-Chalmers tractors.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

We torture truck axles to

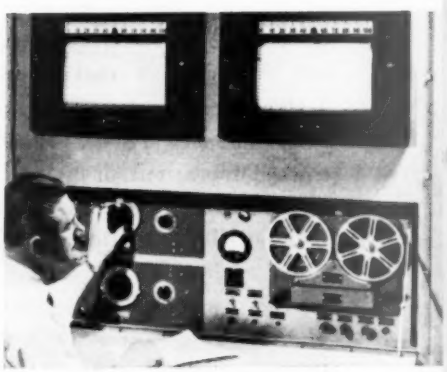
in the new Timken-Detroit indoor proving ground ...and only Timken has it!

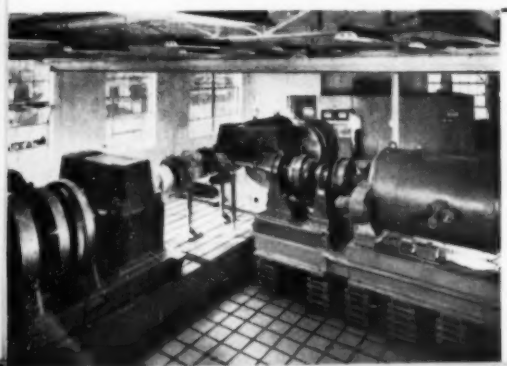
We shock-load, abuse, and torture them. Match every conceivable hauling condition. Then add a few brutal tricks of our own!

Why? So you'll know in advance, and *for sure*, that a Timken-Detroit axle can take the punishment it was designed for. More rugged, grueling punishment than any other trailer axle made!

To prove it, we capsuled a multi-thousand acre proving ground into one room. Here our engineers can put 50 years of experience in building axles for trucks, buses and trailers to work – subjecting axles and gearing *indoors*, to any *outdoor* operating condition.

Such exacting research pays off for you in: longer axle life; less maintenance, repairs and downtime; reduced operating expenses. This is why Timken-Detroit axles are preferred by manufacturers and operators everywhere.

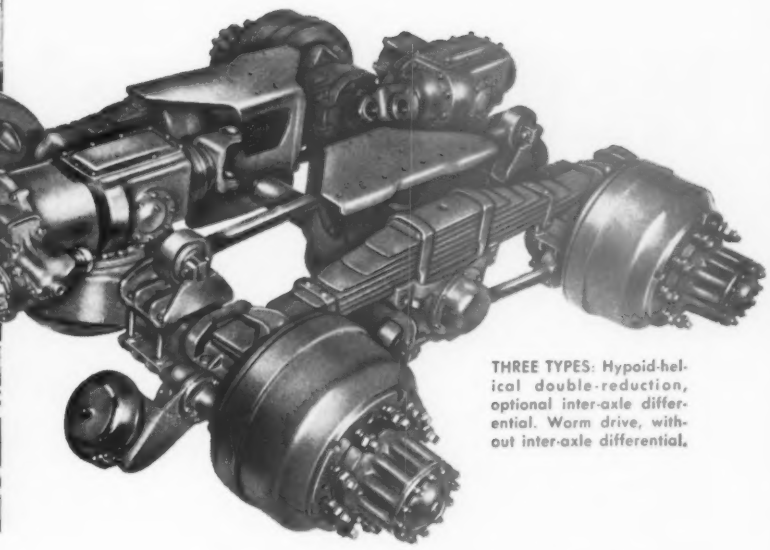




How TDA proves axle quality in this "Torture Chamber"

We pick one of our axles at random . . . then duplicate a hauling condition, hour after hour, day after day . . . simulating half a million miles of the toughest driving situations in just a few days. Or "invent" a test like going uphill with a full load from California to New York nonstop. There is no other axle testing like it in the world!

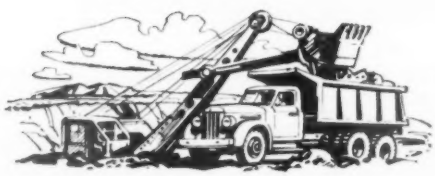
This is our "truck driver." He works in our "Torture Chamber." Above him are graphs showing speed and torque performance under any operating condition he chooses . . . soft ground at full load . . . mountains . . . express highways or side roads. With special dials, recorders and electronic devices, he actually *drives* the axle with scientific accuracy from his chair!



THREE TYPES: Hypoid-helical double-reduction, optional inter-axle differential. Worm drive, without inter-axle differential.

Hauling wet mix? You need Timken-Detroit axles—duplicates of axles that have been given the "works" in our indoor testing laboratory. Simulating the punishment the axle would get hitting a chuck hole with a capacity load every 4 seconds, 24 hours a day, month after month! And it's all done to save you money on maintenance and repairs—make you more money every load.

death



TIMKEN Detroit AXLES

TIMKEN-DETROIT AXLE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
DETROIT 32, MICHIGAN

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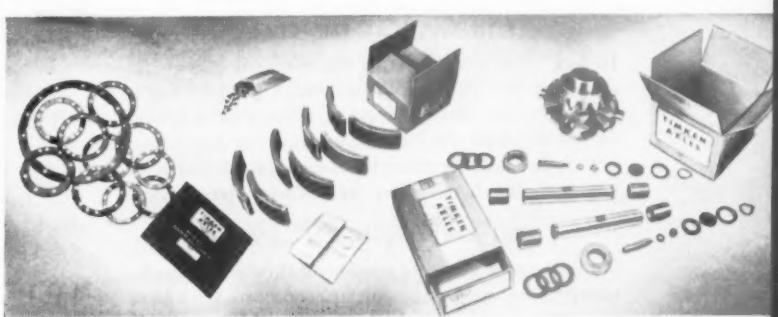
to Save Money on the Job

WORLD'S LARGEST MANUFACTURERS OF AXLES FOR TRUCKS, BUSES AND TRAILERS

For six-wheeler operation . . . the TDA Tandem Drive Rear Axle Unit

Now—the *lightest weight* tandem drive rear axle unit for heavy-duty motor trucks! And with these features, developed, introduced and pioneered by TDA: (1) Available in 3 types of final drives and 3 capacities. (2) Top-mounted straight-line final drive eliminates propeller shaft angularity. (3) Optional inter-axle differential . . . spur gear design, cab-controlled power-lockout. (4) Torsion flow axle shafts . . . guaranteed for 100,000 miles or three years, whichever occurs first. (5) Hot forged steel axle housing . . . guaranteed for the life of the vehicle. (6) Unit-mounted "P" series power brakes . . . for longer life, greater economy and efficiency. (7) Cradle ride spring suspension and paralleled torque rod system . . . maintain correct alignment and weight distribution regardless of driving and braking conditions. (8) Exclusive two-piece trunnion tube bracket speeds servicing. (9) Removable torque rod and spring guide brackets . . . for positive alignment, easier replacement. (10) Rubber torque rod bushings and rubber spring seat bushings . . . eliminate metal-to-metal contact. Require no lubrication.



Increase axle life with Genuine TDA Equipment Parts

Take no chances with ordinary replacement parts. For sure, dependable factory-type jobs, look to genuine Timken-Detroit axle parts kits—identical to your axles' original equipment.

Each kit is *complete*—gives you everything you need—in one handy package. Gaskets and shim parts, brake liners, steering knuckles, differential gears—for every size of brake and axle. Order by number from your dealer. Cut labor and adjustment costs. Get trucks back on the road quicker!

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New Chevrolet Trucks

are powered and priced to save you plenty!

When it comes to saving money, you just can't beat a new Chevrolet truck. Here are two good reasons why this is true—

YOU SAVE AT THE START

In fact, your savings start the moment you close the deal for your new Chevrolet truck. That's because Chevrolet is America's lowest-priced line of trucks. And yet, no other truck at *any* price offers you all the new features and advantages you get in these great new Chevrolet trucks.

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You save on operating costs with thrifty new high-compression power . . . on upkeep costs with new chassis ruggedness. And you get these savings with every new Chevrolet truck—from light delivery models to heavy-duty haulers. In addition, Chevrolet trucks traditionally put you dollars ahead at trade-in time.

Aren't these the kind of savings you want in a truck? Stop in and talk it over with your Chevrolet Dealer soon. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

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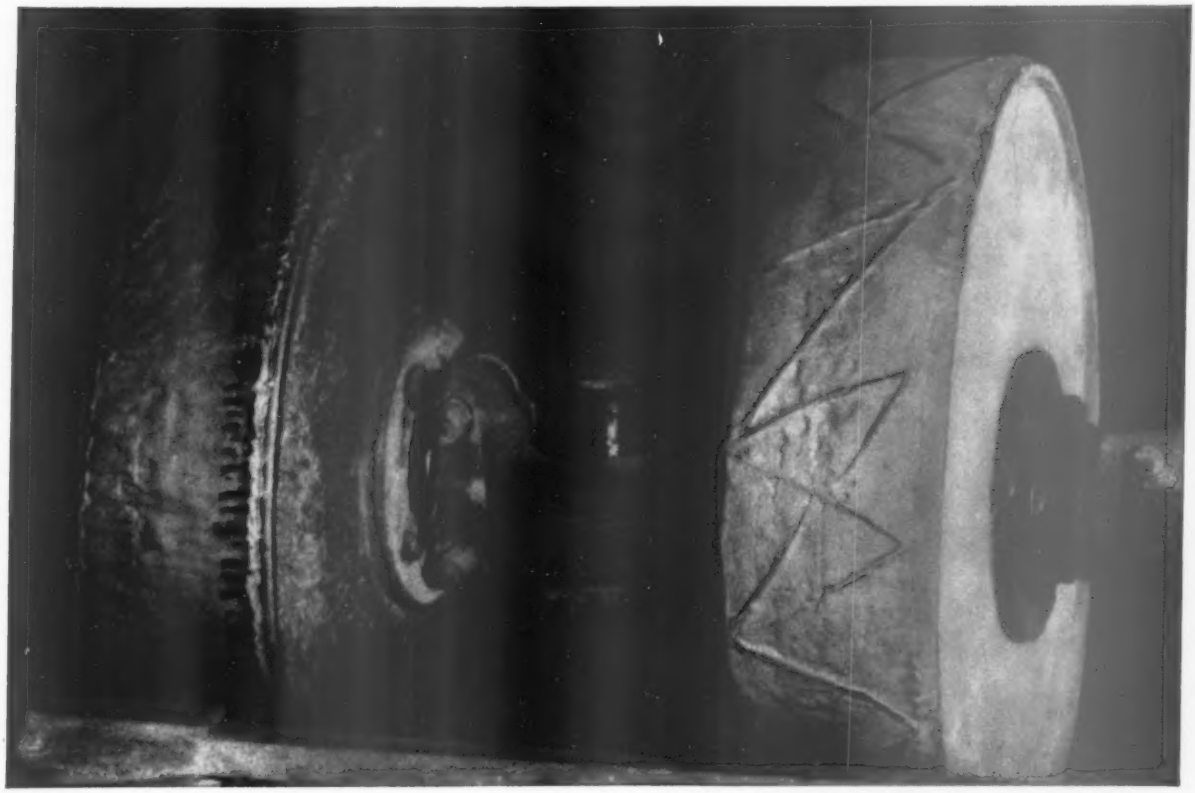
CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

THREE GREAT ENGINES—The new "Jobmaster 261" engine* for extra heavy hauling. The "Thriftmaster 235" or "Loadmaster 235" for light-, medium- and heavy-duty hauling. **NEW TRUCK HYDRA-MATIC TRANSMISSION***—offered on ½-, ¾- and 1-ton models. Heavy-Duty **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **DIAPHRAGM SPRING CLUTCH**—improved-action engagement. **HYPOID REAR AXLE**—for longer life on all models. **TORQUE-ACTION BRAKES**—on all wheels on light- and medium-duty models. **TWIN-ACTION REAR WHEEL BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—greater holding ability on heavy-duty models. **NEW RIDE CONTROL SEAT***—eliminates back-rubbing. **NEW, LARGER UNIT-DESIGNED PICKUP AND PLATFORM STAKE BODIES**—give increased load space. **COMFORTMASTER CAB**—offers greater comfort, convenience and safety. **PANORAMIC WINDSHIELD**—for increased driver vision. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—easier, safer handling. **ADVANCE-DESIGN STYLING**—rugged, handsome appearance.

**Optional at extra cost. Ride Control Seat is available in standard cabs only. "Jobmaster 261" engine on 2-ton models, truck Hydra-Matic transmission on ½-, ¾- and 1-ton models.*



Crushing Life Increased 14 Times *by* **Hard-Facing**

The hard-faced rolls on this rock-crusher mill have been in constant operation for six years. During this time, the rolls have been pulverizing such abrasive materials as ferro-alloys, ore, dolomite, feldspar, rock, sand, and clay used for making brick. Unprotected rolls, performing the same operations, had to be replaced every four or five months.

The serrated roll shown at the right in the photograph is the roughing roll used for initial grinding or milling. The smoother roll, at the left, is a finishing roll used to grind the abrasive materials into a powder. Both rolls were hard-faced with HAYNES STELLITE alloy by the metallic-arc process to protect them from abrasion.

There are 14 HAYNES alloys . . . each developed to resist certain conditions of wear. Some of these alloys are hard and abrasion-resistant, some are tough enough to stand up under heavy impact . . . others resist corrosion, erosion, or heat. Use them to protect bull-dozer blades, dipper bucket teeth, sheepsfoot tampers, tractor rollers and other metal parts exposed to wear.

Your dealer carries a complete line of HAYNES hard-facing rods. Ask him for our descriptive literature. If you don't know the location of your local dealer, write to Haynes Stellite Company, a Division of Union Carbide and Carbon Corporation, Kokomo, Indiana, for full details.

See... **Your local Haynes Stellite Dealer**

or

Write... **to Haynes Stellite Company**

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.

"They Slept on the Problem"

and learned how to produce low-iron glass sand with Cyanamid 800 Series Promoters

Hours of testing had come to naught. Flotation with 800 Series Cyanamid Promoters would produce low-iron glass sand at Del Monte Properties but 65% recovery was far too low. Puzzled and tired, the Pilot Plant Superintendent and the Cyanamid Field Engineer decided "to sleep on the problem". But, on a hunch, they left a batch of sand to scrub at 50% solids in a lab flotation machine.

Next day, instead of white sand, they found a black pulp . . . and the key to a workable process. Prolonged attrition had removed an iron-bearing clay. Flotation of the scrubbed sand now yielded 95% recovery of an 0.055% Fe_2O_3 glass sand!

Del Monte Properties at Pebble Beach, California is an excellent example of the use of chemical flotation to convert beach and dune sand into four valuable, custom-built products.

Raw sands, comprising equal parts of quartz and high-alumina minerals, average 0.12 to 0.15% Fe_2O_3 and 11.5% Al_2O_3. Scrubbed in specially designed attrition machines, these sands are then deslimed, conditioned and the iron-bearing minerals floated, leaving behind 95% of the feed in a finished product that assays 0.06% Fe_2O_3 and 10.76% Al_2O_3.

Flotation reagents per ton include: 0.45 lb. sulfuric acid, 0.40 lb. fuel oil, 0.01 lb. pine oil, 0.55 lb. AERO* Promoter 801 and 0.45 lb. AERO Promoter 825.

Subsequent flotation in another section produces a high-grade feldspar concentrate and a practically-pure (99.07% SiO_2) quartz tail-

*Trade-Mark

ing. Feed to this section can be split to control the quantity of iron tailings floated, thereby controlling alumina in the end product. Del Monte Special "77" Sand, for instance, containing only 6.50% Al_2O_3 and 0.051% Fe_2O_3 commands an active, premium market.

Cyanamid 800 Series Promoters are now being used to beneficiate glass sands, feldspar, garnet, barite, kyanite, rhodochrosite and similar non-metallic minerals. Cyanamid also offers Heavy-Media Separation and Dutch State Mines Cyclone Separator Processes, both of which merit investigation for non-metallic mineral concentration by gravity difference.

With the practical help of a Cyanamid Field Engineer experienced in up-grading low value non-metallics, you may be able to cut costs by less-selective mining, work currently sub-marginal deposits or ship higher-grade end products. Preliminary discussion entails no cost or obligation. Why not write, outlining your problem?

It will pay you to talk with a Cyanamid Field Engineer if you mine or contemplate mining:

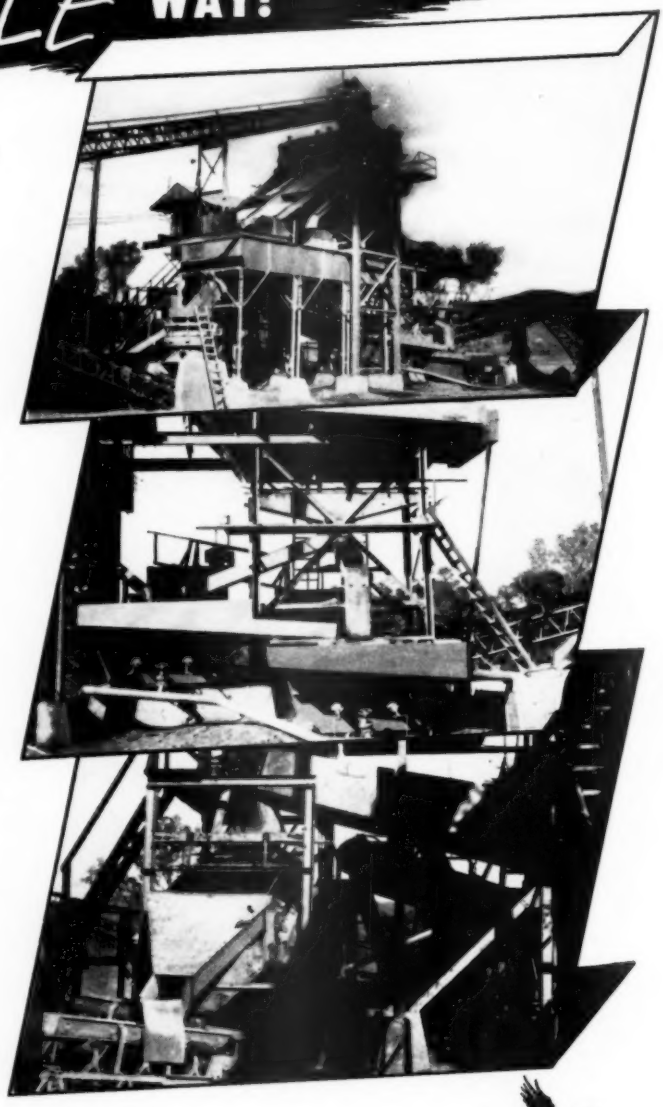
Andalusite · Barite · Bauxite · Cement Rock · Coal · Chromite
Diamondiferous Ground · Dolomite · Feldspar · Fluorspar
Garnet · Glass Sands · Graphite · Gravel · Gypsum · Ilmenite · Iron
Oxides · Kyanite · Magnesite · Manganese · Mica · Olivine
Perlite · Phosphate Rock · Potash · Rhodochrosite · Sillimanite
Salt · Scheelite · Spodumene · Vermiculite · Wolframite

AMERICAN Cyanamid COMPANY

MINERAL DRESSING DEPARTMENT

30 ROCKEFELLER PLAZA, NEW YORK 20, NEW YORK

WINDSOR BUILDING SUPPLIES, INC.
washes, classifies sand by the "Bargeful"
THE EAGLE WAY!



Windsor Building Supplies, Inc., Newburgh, N. Y., on the Hudson River, employs a sound combination of profit-proved Eagle equipment to process materials to the tune of a couple of 600-ton barge loads daily **plus.**

Eagle Equipment at this plant consists of a 10′ x 20′ Water Scalping Tank for removing excess water and to provide preliminary classification, two 36″ x 25′ double screw, long weir, fine material washer-classifier-dehydrators, and a 24″ x 15″ single screw coarse material washer-dewaterer. This unit is equipped with log washer paddles for half its length, from below the water line on up. This washer is pictured at top of lower view.

The one double screw unit produces concrete sand and the other screw unit produces fine sand—sensitive adjustment of the long weir provide for retention or wasting of fines as required. Eagle's exclusive screw action scrubs material and wrings out excess moisture. These units are pictured in center view.

The coarse material unit processes gravel up to 3/4″ which is then screened, minus 3/8″ going to one stockpile and up to 3/4″ going to another.

Wherever aggregate is being produced there is a need for Eagle profit-proved equipment and Eagle engineering experience.

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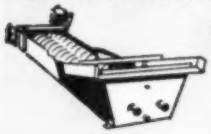
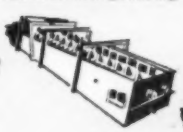

Screw Washers


Log Washers

"Swintek" Dredge Ladders

Clay Crushers

Clay and Cinder Grinders

Shale Planers

Coal Crackers

Problem of Noise in Industry Has Serious Implications

MOUNTING CLAIMS for awards for alleged occupational loss of hearing because of noise, and court decisions that have upheld such demands against industry, have catapulted the problem of noise into proportions of national concern.

The problem has come into the open as the result of court decisions in New York State and Wisconsin, and claims are on the increase as the result of pressure by labor organizations.

Decisions in both the aforementioned states were in favor of workers in drop forge plants and, as a result, industries have expressed alarm at the precedent so established. Rock products producers in New York State are concerned and the problem is one that has enormous potential cost to industry anywhere unless a solution be found.

The New York Workmen's Compensation Act is written to recognize that there be disability from earning full wages, in its definition of "disability" in all occupational disease cases; yet, the Court of Appeals has ruled an employe to be entitled to a schedule award for loss of hearing even though he lost no time from work. This indicates a broadening of the concept of liability to cover purely physiologic loss as well as economic loss.

Decisions such as this could be far-reaching and might well lead to claims involving any of the other human senses, or any physical changes in men, which industry would find extremely difficult to defend. Workmen's compensation systems could be completely destroyed, insofar as they were designed as a compromise between labor and industries to set up specific but limited schedules of compensation payments, for the protection of both sides. The threat is a drive to secure liability payments under the guise of compensation which might be for any ills.

Such conditions could lead to reverting back to the days before compensation laws when, under common law, an employee could sue for unlimited damages on the claim of employer negligence. The employer then had the right, however, to defend his position in court. Workmen's compensation laws were written to remove the serious and continuing financial threat. Employees gave up the right to sue for unlimited damages in return for acceptance by the employer of a limited but certain liability based on the wage-loss principle.

This loss of hearing problem has much more serious implications than the silicosis scare back in the nineteen thirties for the reason that noise is much more widespread than the existence of siliceous materials and their use, and the question of accrued liability applies as well.

It will be recalled that the question of accrued liability in silicosis cases took on such proportions as to paralyze industries wherever the problem of silicosis might possibly arise. Thousands of men were thrown out of work in New York State alone, as rock-drilling and stone crushing operations shut down because they had no protection. Such companies could not get insurance and self-insurors could not stand the burden. This chaotic condition was not corrected until legislation was enacted barring awards entirely for partial disability from silicosis and creating low-schedule compensation for total disability and death.

This problem of noise in relation to hearing is extremely complicated. It involves actuarial and legal concepts, also the fields of engineering, acoustics and medicine and, like any controversial subject, has social and political implications.

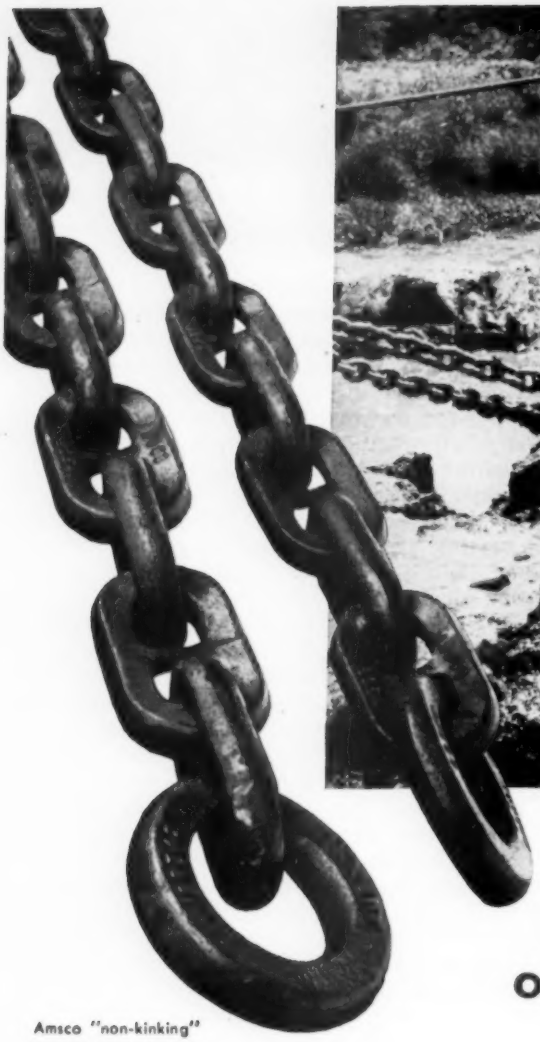
Occupational loss of hearing ordinarily does not interfere with earning capacity or ability to earn a living which, according to the intent of compensation systems, would mean that awards should be only made when there is wage loss.

If occupational loss of hearing be held compensible, how can logical standards be adopted to determine liability since there is so little knowledge of the subject now available? What levels of noise and what exposures to them are injurious? What about individual susceptibilities to noise? How may impairment of hearing from industrial noise be distinguished from normal degeneration of hearing from other causes or with age? What degree of hearing loss constitutes a handicap? These are just a few questions that require research before they may be answered.

New liabilities like this would impose on present compensation cost structures risks for which no provision in compensation insurance rates were provided to cover retrospective liability, which could be a serious blow to all industries, many of which are operating on precarious profit margins.

It isn't to the public interest to have a new cost added to what it buys, and it certainly is not to labor's interests to jeopardize employer's profits at the risk of shutdowns and unemployment in order to gain awards when not needed. But, it will be to the best interests of industry to include noise abatement in its future plans.

Bror Nordberg



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Amsco manganese steel chain resists impact and abrasion, because it is cast from the toughest steel known. Each link has extra metal on the link sides and ends where most of the abrasion occurs.

It work hardens right on your job. Tough service will develop a link hardness up to 500 Brinell. In addition, it will acquire a glasslike polish that helps eliminate life-shortening abrasion.

It has special link design to help keep abrasives out of the link-bearing area, thus materially extending service life and minimizing repairs and down time.

It is designed for specific jobs. A complete line of carefully designed Amsco manganese steel chains are available for dragline, bucket elevating, clinker drag, logging, etc.

Don't buy just any chain . . . specify Amsco manganese steel chain made from the toughest steel known. For information, write Amsco Division, Chicago Heights, Illinois.

Brake Shoe

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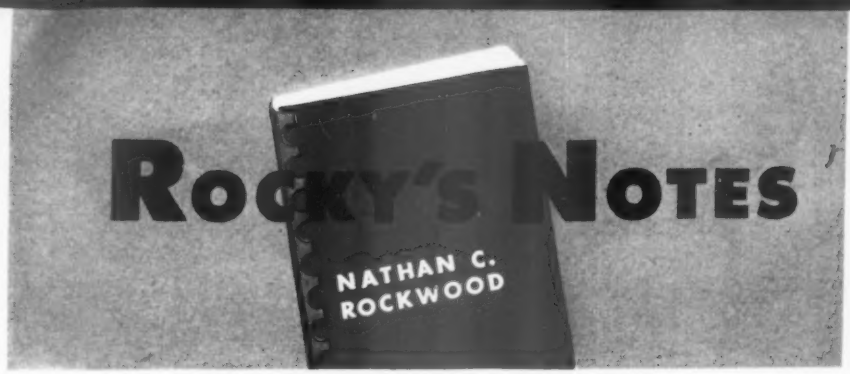


Working Tools for Rock Products Research

MOST OF WHAT WE WRITE for this page is designed to be of general interest even though the subject matter is frequently technical, but this time we are addressing more particularly the younger generation of the industry's chemists and mineralogists. If the non-technical reader gets anything from it, we hope it will be the urge to enthuse some young man on the future profit possibilities of inorganic chemical research. For even the general reader is more or less familiar with the tremendous developments, during this preceding generation, in organic chemistry—the chemistry of hydrogen, oxygen and carbon. To mention only one, there is the entire field of organic plastics, which has resulted in everything from textile fibers to structural materials that compete with steel. In comparison with these developments, the possibilities in inorganic chemistry can scarcely be imagined.

Every rock products producer and manufacturer who makes a hole in the Earth's surface is dealing with the raw materials of inorganic chemistry—the chemistry of minerals and their various combinations. At present, of course, the producer is usually not interested in what he takes out of the Earth beyond preparation of a more or less crude commercial product. Nevertheless, the material he does produce, or that cast aside as waste, contains in some degree nearly all the 90-odd chemical elements that go to make up the crust of the Earth. Whether the material is limestone, sand, gravel, shale, granite, or what have you, it contains in infinitely small amounts, perhaps, chemical elements, which in concentrated form, are finding a vast number of interesting uses in industry, such for example as germanium, fluorine, titanium, vanadium, etc. A generation ago no one was much concerned with such mineral elements except as curiosities, but now we know that some of them are very necessary to the propagation of healthy plants, animals and men, and others are finding unsuspected values in the rapidly growing electronics industry.

Guide To Laboratory Practice

Were we 40 or 50 years younger, with present inkling of the possibilities, we feel sure we would be pursuing a course of research into the mineral kingdom; at this stage we can only hope to interest someone who has more of the future to look forward to. For such a beginner we have before us a splendid new textbook to recommend—"Experimental Inorganic Chemistry,"* by R. E. Dodd and P. L. Robinson, both professors of inorganic chemistry at King's College, Newcastle upon the Tyne in the University of Durham, England. Presumably all students of inorganic chemistry are fairly well versed in ordinary analytical procedures, and this book assumes that much; it is especially designed for those who want to pursue original research, and in this respect probably fills a void that has existed in scientific literature ever since the revival of interest in inorganic chemistry, following fairly recent developments in structural chemistry of crystals.

The best way to review the book in the briefest way is to outline its contents, with such comments as may occur to us as we go along. The first and second chapters deal with basic techniques of laboratory practice, which includes descriptions of apparatus, with directions for constructing much of it as well as its manipulation. This part is good reference material for general readers of scientific papers and articles in our rock products field who may have become, like us, a little rusty on the terminology used in describing laboratory apparatus, experiments and techniques. Chapter 3 concerns the preparation and purification of gases and volatile compounds, and Chapter 4, water, alkalies, acids and solvents. The matter of using the purest possible reagents is easily recognized by the research chemist seeking exact data or minute traces of the rarer elements, and their effects upon the properties of some mineral compound under study. Even ordinary distilled water is not free from contamination, which may seriously affect such experiments.

Colloids and Disperse Systems

Chapter 5 has to do with the study of the colloid state, which is most important in any study of rock products chemistry. The purpose is to give information on how to handle or manipulate colloid material in the experimental laboratory, rather than to go into the chemistry of colloids. This is necessary because some mineral substances are known only as colloids. The authors say their chief concern "is with transitions from *true* solutions to sols in aqueous media; with gels which arise from their further coagulation; and also with the properties of precipitates so far as their particle sizes are likely to fall into the colloidal, and consequently, unfilterable, range. Belonging to the sols and gels are the condensed acids (silicic, tunsic) and the hydrous oxides (ferric oxide, aluminum oxide)." The distinction between a true solution and a sol is seldom made in cement and concrete research literature. The use of the term "soluble silica" is almost universal, but probably such silica in most instances, is actually in the form of a dispersed colloid, small enough to pass through filter paper, and hence in a sense "soluble," but not in true solution. This undoubtedly has considerable bearing on the kind of compounds formed of hydrated silica, alumina, lime, etc., none of which is more than slightly soluble in a true sense in aqueous media.

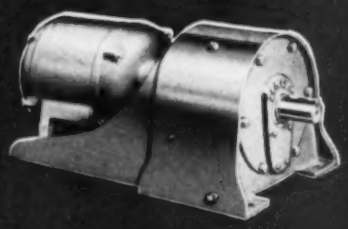
Regarding silica gel, it is said to "contain from 6 to 300 molecules of water per molecular unit of silicon dioxide, with a corresponding variation of texture from a brittle, less hydrous material (which may be powdered) to a very soft, hydrous jelly, which behaves rather like a viscous liquid. The dehydration curves do not exhibit much evidence of definite hydrates, and the X-ray evidence suggests that the crystalline centers of colloidal dimensions are cristobalite silica." Those who have learned something of the structural chemistry of the silicates will recall that cristobalite has a rather open lattice of SiO_4 tetrahedrons, which would provide plenty of space for molecules or colloidal particles of calcium hydroxide to become enmeshed in more or less regular pattern. It is up to the researcher in inorganic chemistry to find out whether this is the actual case, or whether the calcium ion is part of the lattice or structural framework of a new compound—the alleged hydrated calcium silicate of set cement. The present X-ray evidence of an hydrated tricalcium or dicalcium silicate lattice is not convincing.

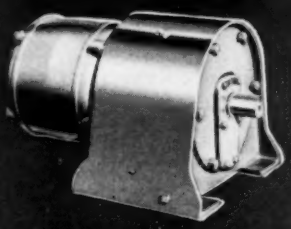
Chapter 6 is on physical methods of laboratory testing and experiment. These include determination of melting and freezing points, vapor pressures, densities, surface tension, etc., all of which are important in cement and concrete research. Last, brief, but important in Chapter 7 are suggestions for searching the literature for relevant references to the subject under investigation and for the preparation of reports and scientific papers. Finally, there are warnings to insure safe handling of laboratory

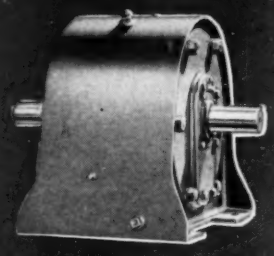
(Continued on page 120)

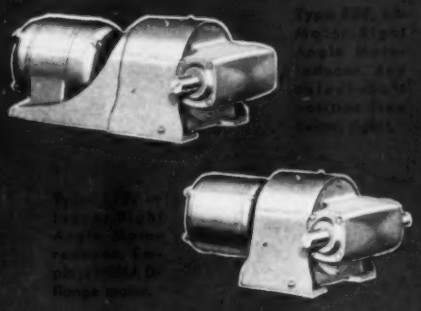
*Elsevier Publishing Co., 402 Lovett Boulevard, Houston, Tex., December 1953, price $6.50.

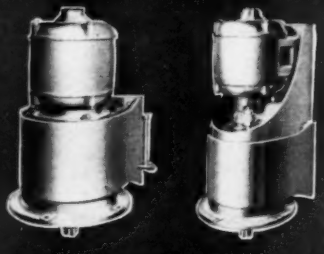
ALL-STEEL FALK Motoreducers

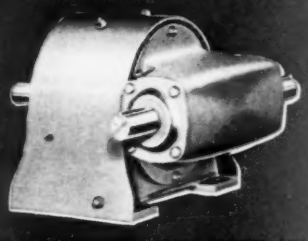












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All-steel FALK Motoreducers—both the All-Motor and Integral types—are available in horizontal and vertical models with double, triple or quadruple reduction; concentric and right-angle shaft arrangements. They cover a surprisingly wide range in horsepowers and in output speeds. Every FALK Motoreducer is built and rated according to AGMA standards.

Whatever your reduction requirements—be they simple, complex or "different"— it is just good business to consult FALK, recognized leader in the Motoreducer and speed reducer field. Write to Department 247.

Every FALK Motoreducer has these "IN-BUILT" Factors

All-steel Housings. Unbreakable, strong, rigid. Generous overhung load capacities provided by wide bearing spans, large shafts and bearings.

Precision Gearing. Heat-treated alloy steel, precision cut and shaved helical gearing throughout . . . quiet-operating crown shaved pinions . . . taper bored gears for easy ratio changes.

Sealed Housings. Dual closures and one-way vents keep oil in, dust and moisture out. Units are splashproof, leakproof, dustproof.

Wide Speed Range. Selective ratio combinations provide output speeds from 1.5 rpm to 1430 rpm with stock gears.

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Positive Lubrication. Large sump capacity . . . oil-tight construction assures clean lubricant . . . direct dip of revolving elements provides positive lubrication at all speeds.

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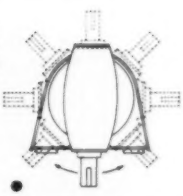

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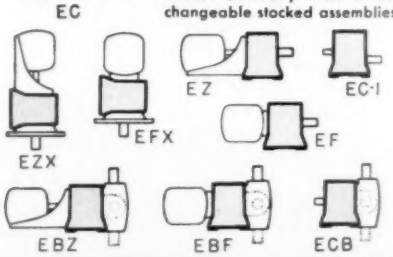

FALK ...a good name in industry

THE FALK CORPORATION, 3001 W. Canal St., Milwaukee 8, Wis.

WRITE TO DEPARTMENT 247

PEOPLE in the news

Ideal Appointments

S. A. GRETENCORT has been promoted to division superintendent of the central division of Ideal Cement Co., Denver, Colo., with headquarters at Ada, Okla. Frank A. Sutcliffe has been appointed plant manager at Gold Hill, Ore.; George Koonsman has been promoted from plant engineer at Boettcher, Colo., to assistant plant manager at Devil's Slide, Utah; Gayle N. Davis has been transferred from plant manager at Ada, Okla., to plant manager at Boettcher, Colo.; David O. Howe has been transferred from plant manager at Boettcher to plant manager at Ada; Stanley Sajkowsky has been transferred from plant manager at Gold Hill, Ore., to plant manager at Redwood City, Calif.; and Eldred F. Bollinger has been transferred from plant manager at Redwood City to plant manager at Baton Rouge, La. Horace Straight has been promoted from assistant plant manager to plant manager at Devil's Slide, Utah. He succeeds A. W. Hooton who has been made plant manager at Portland, Colo.

Plant Manager

HUGH H. BEIN has been appointed manager of the sand plant of Del Monte Properties Co., Pebble Beach, Calif., succeeding the late William E. Messner. Mr. Bein, who has had many years' experience in mining, milling and geological work, attended the Colorado School of Mines and graduated from the University of Wyoming, Laramie, Wyo. Before joining Del Monte, he was with the American Cyanamid Co., which is operating a research laboratory for the Atomic Energy Commission in Winchester, Mass. Previously he was with the Atomic Energy Commission in Colorado.

Hugh H. Bein

Named Treasurer

MILTON FALKOFF has been appointed treasurer of Material Service Corp., Chicago, Ill., to fill the vacancy left by Frank J. Clifford who has retired. Mr. Falkoff, who has been with the company since 1947, was formerly with the Bureau of Internal Revenue.

Sales Manager

BRENDAN J. WHITTAKER has been appointed sales manager of the Boston territory of Universal Atlas Cement Co., New York, N.Y. A native of Boston, Mr. Whittaker is a graduate of Wentworth Institute where he majored in architectural construction. From 1926 to 1929, he was field engineer for the Portland Cement Association in charge of concrete structural and products promotion. He joined Universal Atlas in 1929 at Boston as a salesman, was promoted to district sales manager at Albany, N.Y., in 1935, and three years later was appointed district sales manager at Boston.

Brendan J. Whittaker

On Board of Directors

WALTER A. WECKER, president and director of Marquette Cement Manufacturing Co., Chicago, Ill., has been elected a member of the board of directors of Poor & Co. Mr. Wecker has been associated with Marquette since 1914 and has been president and director since 1933. He is also a director of the Portland Cement Association and the Chicago Association of Commerce and industry.

Walter A. Wecker

Warner Appointments

GEORGE I. PURNELL, JR., has been appointed plant superintendent at the Cedar Hollow lime plant of Warner Co., Philadelphia, Penn., to succeed J. G. Wilson who was recently named chief design engineer. Mr. Purnell was formerly personnel manager at Cedar Hollow and will be succeeded in this position by James J. Miller, formerly foreman of the loading department at Cedar Hollow. Mr. Purnell joined the Bellefonte plant in 1942. After three years' service in World War II, he returned to the engineering department at Bellefonte and in 1947 was transferred to Cedar Hollow. In 1952 he was appointed personnel manager at Cedar Hollow. Mr. Miller joined the company in 1946 as a car inspector in the lime plant. In 1950, he was promoted to foreman of the loading department where he served until his present promotion.

Named Vice-Presidents

E. A. HARRIS, formerly works manager, has been elected vice-president in charge of production, Aetna Portland Cement Co., Bay City, Mich. L. B. Thomas, sales manager, has been named vice-president in charge of sales. Alex Devens, formerly superintendent, has been made general superintendent, and Paul Bischoff has been made research engineer, in addition to his duties as chief chemist.

Association President

WILSON P. FOSS, III, president, New York Trap Rock Corp., New York, N. Y., has been elected president of the New York State Crushed Stone Association. Mr. Foss was a member of the board of directors of

Wilson P. Foss, III

the Association from 1948-1953, and a vice-president since 1953. He is also a director of the National Crushed Stone Association and a member of its executive committee. Mr. Foss' grandfather, the late Wilson P. Foss, founded the New York Trap Rock Corp. in 1919. His father, Wilson P. Foss, Jr., is chairman of the board. After graduation from Yale University in 1937, Mr. Foss joined the company as a sales engineer and served in that capacity until 1942 when he entered the Navy. He returned to the company in 1946 as vice-president in charge of operations, and two years later was appointed president.

Named Superintendent

WILLIAM A. WILLIS has been named superintendent of the Nichols, Fla., superphosphate plant of Virginia-Carolina Chemical Corp., Richmond, Va. William C. Thomas and Joseph W. Venable have been appointed assistant superintendents; James Edgar Hatch, assistant superintendent in charge of the sulphuric acid plant; and M. J. Houston, engineer.

Mr. Willis, a graduate of the University of Illinois with a B.S. degree in chemical engineering, joined the company in 1937, serving with the purchasing, chemical control and mining departments in Richmond until his transfer to Memphis, Tenn., in 1948 as factory superintendent. He moved to Florida in 1952 when construction of the new plant was started.

Mr. Thomas is a graduate of North Carolina State College, where he received a degree in chemical engineering. He joined Virginia-Carolina in 1946 at the sulphuric acid plant in Wilmington, N. C., and was transferred to Nichols in 1953.

Mr. Venable joined the chemicals division laboratory in 1948 and served as team leader in the research department from 1949 to 1951. He worked on special staff projects, including the concentrated superphosphate plant and uranium recovery unit from 1951 to 1953. A graduate of the University of Alabama with a B. S. in chemistry and an M. S. in physical chemistry, he was transferred to the Nichols, Fla., plant in 1953.

Mr. Hatch has been with the company since 1937 and formerly served as a superintendent in the sulphuric acid department at the Nichols plant.

Mr. Houston, a graduate of Bradley Polytechnic Institute, Peoria, Ill., joined the company in 1944 in Jacksonville, Fla. He was transferred to the fiber division in Taftville, Conn., in 1948.

Commodity Manager

J. P. NICELY has been appointed general commodity manager of National Gypsum Co., Buffalo, N.Y., succeeding David G. Stenberg, who has been promoted to central division manager. Formerly district sales manager for the Washington, D. C., district, Mr. Nicely attended the University of Tennessee and is a graduate of Tennessee State College. He joined the company in 1941 as a salesman and since then has been commodity manager for insulation board and assistant district manager in Baltimore.

Sales Manager

ROBERT C. FLOOD has been appointed sales manager of the Iowa-Wisconsin division of Marquette Cement Manufacturing Co., Chicago, Ill. He succeeds O. W. Rath, who passed away last December 16. He was formerly a salesman in the central division.

Robert C. Flood

Heads Association

HARRY H. LONGENECKER has been elected president of the Eastern Concrete Products Association. T. K. Nitterhouse, Nitterhouse Concrete Products, Chambersburg, Penn., was elected first vice-president; John T. Fizzano, Fizzano Bros., Inc., Crum Lynn, second vice-president; and H. Melvin Binkley, E. Petersburg, secretary-treasurer.

Named Vice-President

GARVIN PELSUE has been elected vice-president in charge of plant operations of The Jaeger Machine Co.,

Garvin Pelsue

Columbus, Ohio. He was formerly manager of plant operations. Mr. Pelsue is a past president of the National Ready Mixed Concrete Association.

25 Years of Service

ARTHUR H. O'CONNOR, sales manager and assistant secretary of Material Service Corp., Chicago, Ill., was recently enrolled in the Quarter Century Club, becoming the youngest employe of the company and possibly the youngest in the country to be enrolled in the Quarter Century Club. Mr. O'Connor, who is 42 years old, started as an office boy, rising through the accounting, purchasing, order board, pricing, and sales departments of the company to his present position. Col. Henry Crown, chairman of the board, presented him with an engraved watch to mark the anniversary.

Heads Sand Firm

ELLIS H. ROSS has been elected president of the Ross Sand Co., Inc., Concordia, Kan., which has been changed from a general partnership to a corporation. Merle Holstead has been named vice-president, and James Day, secretary-treasurer. Harvey Hoelscher and Jack Strait are directors of the company.

P.C.A. Manager Retires

RODNEY D. BREWER, manager of the publications bureau of the Portland Cement Association, Chicago, Ill., has retired after 38 years of service with the Association. He will be succeeded by Jack L. Schneider, assistant manager of the publications bureau. Mr. Brewer, who joined P.C.A. in 1916, served as manager of the Chicago office for 20 years before his appointment as manager of the publications bureau. Prior to that he was associated with the Universal Atlas Cement Co. for five years. Mr. Schneider, a journalism graduate of the University of Illinois, joined the Association in 1948 as a writer in the advertising and publications bureau, and was made assistant manager of the bureau in January, 1954. Mr. Schneider is also assistant secretary of the Portland Cement Association.

Assistant Manager

R. R. WILLIAMS, JR., has been appointed assistant manager of the mining department of the Colorado Fuel and Iron Corp., New York, N.Y. The mining department supervises operation of mines and quarries in Colorado, Utah and Wyoming and oversees purchase of additional raw materials in the states of New Mexico and Arkansas. The department is also responsible for development of reserves of raw materials. Mr. Williams was formerly superintendent of blast furnaces at the Pueblo, Colo., plant and will be succeeded by John Munson, assistant superintendent.

Named President

EDWARD J. BALF has been elected president of Edward Balf Co., Hartford, Conn. He succeeds Ernest R. Molt who has been named chairman of the board. Mr. Balf, who is also treasurer, joined the company in 1931, after graduating from Fordham University with a degree in civil engineering. He is president of the Hartford Concrete Credit Association and treasurer of the Connecticut Bituminous Producers' Association. He is a member of the Connecticut Society of Civil Engineers.

On Manufacturers' Board

HARRY B. ROBERTS, sales manager, Ideal Cement Co., Union division, Salt Lake City, Utah, has been named to the board of directors of the Utah Manufacturers' Association.

Industrial Consultant

C. H. CASE, assistant division manager of Kaiser Engineers, Oakland, Calif., has gone to Japan as a member of a four-man study team from the International Bank for Reconstruction and Development for the purpose of surveying Japanese industry in regard to possible future loans by the bank. He was chosen to accompany three staff members of the bank as an industrial and technical consultant. A graduate chemical engineer from Ohio State University, Columbus, Ohio, Mr. Case has been associated with Kaiser Engineers since 1948.

Vice-President Retires

NEAL R. FOSSEEN, vice-president, and Ernest L. Frank, assistant treasurer of the Washington Brick and Lime Co., Spokane, Wash., have retired after 33 years of service. Henry Leipham, head of the drafting department, has also retired after 17 years with the company.

Association Officers

W. J. BRULL, St. Cloud, Minn., has been elected president of the newly organized Minnesota Concrete Products Association. Curtiss J. Goodman, Goodman Concrete Products, Bemidji, has been elected first vice-president; T. M. Seppi, Virginia, second vice-president; Donald O. Erickson, Glacier Sand and Gravel Co., Minneapolis, secretary; and W. J. Molin, St. Paul, treasurer.

Division Manager

DAVID G. STENBERG, formerly general commodity manager, has been appointed central division manager of the new sales division of National Gypsum Co., Buffalo, N.Y., covering Minneapolis, Chicago, Detroit, Cleveland, Pittsburgh and Buffalo sales districts. Mr. Stenberg joined the company in 1939 as a salesman, subsequently serving as district manager for the Detroit and Chicago sales districts and commodity manager for mason's supply sales.

Named Vice-Presidents

R. D. STEPHAN has been named vice-president of dealer sales for United States Gypsum Co., Chicago, Ill. G. J. Morgan has been appointed merchandising vice-president. F. L. Stellner, secretary, has been made a director. He succeeds Donald B. Lourie, who has resigned to become Under Secretary of State. James R. Carr, formerly mine engineer, has been promoted to mine superintendent at the Heath, Mont., plant.

Executive Vice-President

BLAINE E. YUNDT has been appointed executive vice-president of the Fry Coal and Stone Co., Mercersburg, Penn. He was formerly secretary-treasurer. Betty L. Shaffer has been appointed secretary, and Edwin C. Baker, treasurer.

Production Manager

ROBERT E. SCIFRES has been appointed production manager of gypsum plants, National Gypsum Co., Buffalo, N.Y., and R. E. Gill has been named production manager of lime plants. William Mitchel has been promoted to assistant plant manager and production superintendent for the Clarence Center, N.Y., plant.

Chief Highway Engineer

RALPH R. BARTELSMEYER, former field engineer for Marquette Cement Manufacturing Co., Chicago, Ill., has been named chief highway engineer by Gov. Stratton of Illinois. He succeeds Frank N. Barker, who resigned to accept a position with the Santa Fe railroad.

Joins Concrete Firm

ROBERT A. JAMIESON has resigned as dean of the College of Commerce at Bradley University to accept the position of assistant to Jacob H. Irions, president of Irions' Quality Concrete Co., Irions' Concrete Block Co., and Chillicothe Gravel Co. Mr. Jamieson will also act as sales manager of these companies.

General Manager

E. C. WEICHEL, JR., formerly superintendent of the Bartow, Fla., plant of Humphreys Gold Corp., Denver, Colo., has been appointed general manager of the Trail Ridge ilmenite mine and the new Highland plant now under construction.

C. of C. Director

WILLIAM N. FRY, president of the Fischer Lime and Cement Co., Memphis, Tenn., has been named a director of the Memphis Chamber of Commerce.

Chairman of the Board

LOUIS C. LERNER, vice-president, has been elected chairman of the board of Victoria Gypsum Co., Ltd., Nova Scotia.

OBITUARIES

WALTER W. ROOP, superintendent and a partner of Roop Quarries, Warrensburg, Mo., died March 4 at his home after an illness of several months. He was 60 years of age.

CLARE BLINN, a partner in the Home Builder Supply Co., Toledo, Ohio, died while enroute home from a Florida vacation. He was 55 years old and had been in the building supply business in Toledo for 28 years.

G. CHESTER BRITTON, retired district manager of the Philadelphia office of the Portland Cement Association, died March 1. A civil engineering graduate of Rensselar Polytechnic Institute, Troy, N.Y., Mr. Britton had been with the association for many years, retiring two years ago.

A million yards a month COPPER!

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"THE PRIDE OF THE PIT"

Since July 1952 at Anaconda's new mine in Nevada, four 5-yard P&H Model 1500 Electric Shovels have been stripping overburden and copper ore on a 24-hour schedule, 6 days a week. Average production for each machine is 7,000 tons per 8-hour shift, as the Yerington mines ore production reaches 11,000 tons per day. Much of this digging has been done in ground without resorting to blasting.

It's the kind of digging where P&H performance shows up such advanced features as all-welded construction, Magnetorque* hoist, independent propel, powerful worm crowd, stepless control. Remember, too, that P&H electrical equipment is designed and built for shovel service.

Steady, dependable production at low tonnage cost — that's the reason why every third P&H Electric Shovel sold is a repeat order. Get the facts. Ask us to send Bulletin X-139.

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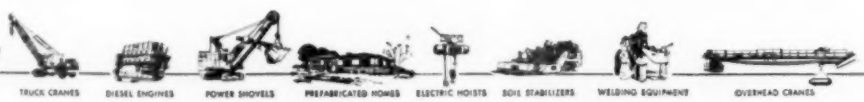


LABOR RELATIONS TRENDS

Management Rights To Fire—Unions Can Be Sued Under Anti-Trust Laws

By NATHAN C. ROCKWOOD

IT IS ONLY TOO APPARENT that the coddling of labor unions during the past 20 years has resulted in arrogance not merely on the part of union bosses but frequently on the part of individual union members. A recent example was decided adversely to the union and its members by the U. S. Circuit Court of Appeals, Ninth Circuit (San Francisco, Calif.) on March 8, 1954. The National Labor Relations Board had petitioned the Court to enforce an order or finding that the Sunset Minerals, Inc., had violated the law in discharging two employes for engaging in a walkout over grievances, which the Board contended was a protected activity.

The Court's decision was that the N.L.R.B. did not prove its case, and that under the circumstances the employer only exercised his legal rights in firing the two employes. The text of the decision is in part as follows: "The National Labor Relations Board (hereafter the Board) petitions for the enforcement of an order requiring Sunset Minerals, Inc. (hereafter respondent) to reinstate with back pay two of its employes, the Board having held their discharge to be an unfair labor practice because its purpose was to punish them for engaging in a strike to compel the respondent to cure certain grievances presented to respondent by the discharged men's union, Local 18 of the International Union of Mine, Mill and Smelter Works (hereafter the union).

Details of Case

"Respondent has attacked the findings of the Board as not being supported by the evidence. The uncontradicted facts are that the union was the certified bargaining representative of the respondent's employes; that the labor contract between the union and the respondent contained a provision that 'the union shall have the right to maintain a grievance committee,' which had not been acted upon for several years; that on May 31, 1951, respondent received from the union a list of 16 grievances concerning working conditions; that several of the grievances were corrected the following few days; that on June 4, 1951, some 20 men out of a crew of 44 did not report for work; that the union did not order or authorize a strike and that the action of its members, if considered a strike, was what is commonly called a 'wildcat' strike; that of these 20 men, three were on vacation, one was sick, and 11 had asked for and received permission to be off work; that of the remaining men, three replied that they had 'gone fishing' and two gave no reason when asked why they had been absent; that these five men had been discharged, purportedly for not reporting for work and for not having received permission to be absent; that a company rule provided for the discharge of employes who failed to report for work without first having received permission; and that a strike resulted from these discharges, which was settled by the reinstatement of three of the five men.

N.L.R.B.'s Finding

"The findings which are disputed by respondent are that the June 4 walkout was a protest over working conditions and that the five men were discharged because they had participated in this concerted activity.

"The record contains evidence tending to show that during the month of May, 1951, a number of complaints relating to working conditions in respondent's mines had been made by the employes; that no overt moves to correct these grievances were made until after the union had written a letter concerning them which the respondent received on May 31, 1951; that respondent thereupon took immediate steps to correct the worst of the defects, including the use of special crews at overtime pay on Sunday, June 3. The grievances which were not immediately corrected necessitated the purchase of materials from distant points and, in some cases, the hiring of specialized labor.

"On Monday, June 4, 1951, the alleged walkout took place. On their return, the men told respondent's shift boss, a supervisory employe with the power to hire and fire, that they had 'gone fishing.' (It should be noted that June 4, 1951, was the opening day of fishing season in the area.) The Board found that respondent had discharged the two men because they had engaged in a protected concerted activity—a walkout over grievances.

"The evidence as a whole reveals that although the respondent was taking prompt action upon the grievances of the men, they walked off the job. Upon their return the men did not claim that they had walked out because of the grievances, but to the contrary stated that they had gone fishing. In these circumstances we do not see how the employer can be said to have discharged men for engaging in a protected concerted activity when they had no knowledge that such activity was occurring.

"In many respects this case parallels that of N.L.R.B. v. Draper Corporation, 145 F. 2d 199 (Cir. 4), where the court stated on page 205: 'It should be noted that a 'wild cat' strike in violation of the purposes of the act and of an agreement existing between the employer and employes for orderly collective bargaining is clearly distinguishable from a strike which, although not justified, nevertheless accords with the rights of the parties under the National Labor Relations Act. . . . Minorities who engage in 'wild cat' strikes, in violation of rights established by the collective bargaining statute, can find nothing in that statute which protects them from discharge.'

Court's Decision

"Even if the walkout in this case had been a strike, it was a strike in violation of the grievance and safety procedures laid down in the contract between the union and the respondent and hence was not a protected activity. See N.L.R.B. v. American Mfg. Co. of Texas, 203 F. 2d 212, 216-217 (Cir. 5), and cases cited.

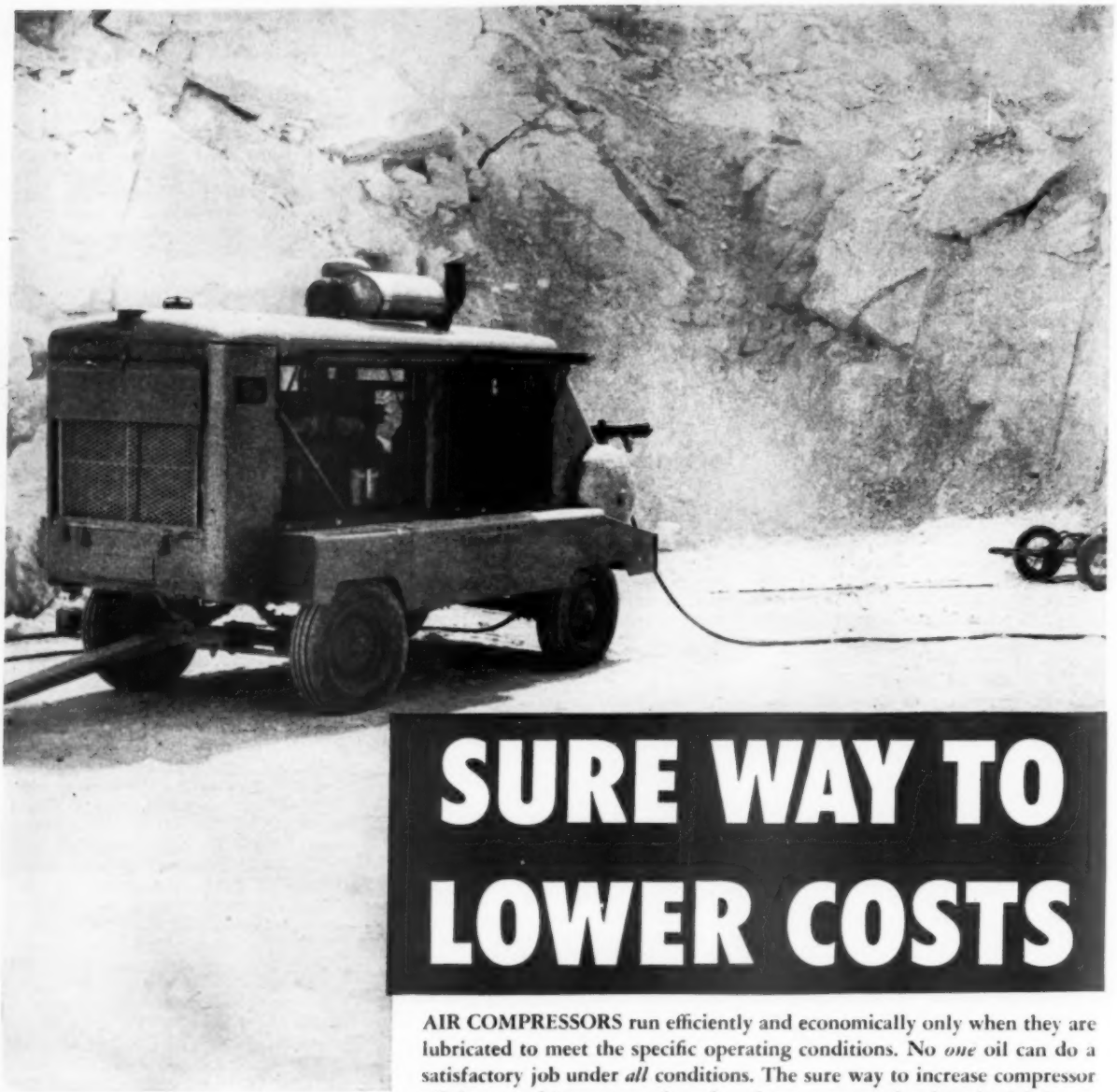
"We recognize the power of the Board to draw 'reasonable inferences' from the evidential facts found at the hearing, see Radio Officers' Union v. N.L.R.B., 346 U. S., but we hold that the inferences drawn by the Board in this case were not reasonable. We deny enforcement to the Board's order because we 'cannot conscientiously find that the evidence supporting that decision is substantial, when viewed in the light that the record in its entirety furnishes, including the body of the evidence opposed to the Board's view.' (Universal Camera Corp. v. N.L.R.B., 340 U. S. 474, 488.

"The Board's petition for enforcement of its order is ordered denied."

Union-Management Conspiracy

A very significant decision of the United States Supreme Court was handed down March 8, 1954, in a case involving a labor union conspiracy in restraint of trade; hence both the union and the employers are open to civil suits from injured parties. The case is especially significant to rock products producers and manufacturers because it involved the plastering industry, and one intent of the conspirators was to restrict the market for plastering materials. The decision (there were really two to take care of the two associations) was in the cases of United States v. Employing Plasterers' Association of Chicago, Journeymen Plasterers' Protective and Benevolent Society, Local No. 5, et al, and United States v.

(Continued on page 121)



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industry news

Cover Picture

ON THIS MONTH'S COVER is an illustration of the R. J. Noble Co., sand and gravel plant near Orange, Calif. This interesting plant utilizes a series of belt conveyors to transport raw materials from the pit to the plant. A D type Caterpillar diesel-powered tractor, equipped with a No. 8U bulldozer, moves excavated material to a surge pile into a hopper which feeds to the first leg of the series of conveyors inclining up to the screening and crushing plant. This arrangement cuts intra-plant haulage costs to a minimum, and provides flexibility in the handling materials in the pit.

Florida Cement Expansion

THE FLORIDA PORTLAND CEMENT DIVISION, Tampa, Fla., of General Portland Cement Co., Chicago, Ill., recently completed its second expansion program in five years, in order to keep up with the growing demand for cement in Florida. Consumption of cement in Florida reportedly has grown from 2,000,000 bbl. in 1945 to approximately 7,500,000 bbl. during 1953.

The first expansion program at the Tampa plant was completed in 1949 with the addition of a new 426-ft. kiln and grinding equipment, which increased capacity from the previous 1,500,000 bbl. annually to 2,750,000 bbl. per year. Another kiln of the same capacity was installed during the second expansion program, recently completed, increasing capacity to 4,000,000 bbl. of cement annually. The Tampa plant has the advantage of deep-water dock facilities for loading and unloading of ocean-going ships, and it has ready access to company-owned limestone property and leased clay deposits in a 50-mi. radius.

Indiana Gypsum

NEWLY DISCOVERED GYPSUM deposits in Martin County, Ind., State Forest were recently offered for lease by the State Conservation Department. The department stated it would lease 60 percent of the forest's 3500 acres to the company with the first plant in operation, with the remainder to be leased to other interested companies. United States Gypsum Co., Chicago, Ill., National Gypsum Co., Buffalo, N.Y., and Certainteed Products Co., Ardmore, Penn., reportedly have sought mining rights. The state will obtain a one percent royalty fee per ton of gypsum.

Canadian Gypsum

CANADIAN GYPSUM COMPANIES reportedly produced and shipped larger quantities of gypsum wallboard, lath and sheathing in 1953 than during the preceding year. Combined production of these products during 1953 amounted to 535,357,000 sq. ft., compared to 446,090,000 sq. ft. in 1952, while 1953 shipments totaled 531,208,000 sq. ft., as against 445,173,000 sq. ft. for the preceding year. Production of gypsum plasters totaled 239,000 tons in 1953, compared with 203,000 tons in 1952.

Minerals Firms to Merge

ATTAPULGUS MINERALS & CHEMICALS CORP., Philadelphia, Penn., large producer of fullers earth, and Edgar Brothers Co., Metuchen, N. J., producer of kaolin, have agreed upon a merger to form a new company, American Minerals & Chemicals Corp. The merger is subject to ratification by directors and stockholders.

Under the proposed plan, the merged company will authorize an issue of 5 percent convertible preferred stock, par value $50 per share, convertible for five years into common stock at the rate of 2½ shares of common for each share of preferred.

Officers of the merged company will include: James Deshler, president of Edgar Brothers, chairman; Wright W. Gary, president of Attapulgus, president; and David E. Lilienthal, now chairman of Attapulgus, chairman of the executive committee and of the research policy committee.

Attapulgus, which operates mines and a processing plant in Georgia, also owns patented processes for concentrating mineral ores, which it licenses to others. The company also maintains research laboratories in Lakeland, Fla., and in Camden, N. J. Porocel Corp., a wholly-owned subsidiary, produces activated bauxite at Berger, Ark.

Edgar Brothers Co., besides owning kaolin deposits, operates two mines, five processing plants and research laboratories in Georgia.

Cement Firm Granted Fast Tax Write-Off

RIVERSIDE CEMENT CO., San Francisco, Calif., was recently granted a "certificate of necessity" by the Office of Defense Mobilization, which permits the company to write off for tax purposes 35 percent of $4,102,000 worth of electric power facilities over a 5-year period instead of the longer amortization period normally required by the government for recovering the cost of such facilities from income.

The purpose of the fast tax write-off program is to spur capital investment in industrial facilities needed to produce defense and defense-related goods and services. The O.D.M. certificate permits a portion of the cost of the new facility to be deducted from taxable income at a faster rate than normally allowed which, in effect, reduces the operator's income tax payments during the early years of operation of the new facility.

Irving Crown (left), executive vice-president, Material Service Corp., Chicago, Ill., and George W. Lenzie (right), vice-president in charge of production, welcome George M. Heinz (left center) and Anthony Krameric (right center) into the company's Quarter Century Club, which now numbers over 50 members. Engraved gold watches were presented to the new members

Cement Plant Bonds Repaid

THE SOUTH DAKOTA STATE CEMENT COMMISSION, operator of The South Dakota Cement Plant, Rapid City, S. D., recently authorized transfer of $500,000 in cement plant funds to the state's general fund, and also voted to call the remaining $900,000 of a $1,500,000 bond issue five years ahead of the maturity date. The bond issue was authorized by the 1949 legislature for internal improvements at the plant, which increased capacity from 650,000 bbl. of cement annually, to 1,350,000 bbl.

The state-owned cement plant reportedly has put more than $1,250,000 into the state treasury during the past 11 years, plus $425,000 transferred to a special concrete road fund of the State Highway Commission. The plant, established in 1924, now has an estimated replacement value of $12,000,000. During 1953, 1,415,405 bbl. of cement were produced, with sales totaling $4,516,688.

Phosphate Plant

A $1,100,000 PHOSPHATE ROCK GRINDING PLANT has been announced by the Board of Commissioners of the Lake Charles, La., Harbor and Terminal District. The new plant, which will be located on the west side of the Calcasieu River in West Lake, is expected to be in operation by early this fall. The new grinding facilities, which are a part of the Lake Charles large port expansion program, will be made available for such international firms as American Cyanimid, International Minerals and Chemical Corp., Virginia-Carolina Chemical Corp., and Swift and Co., all producers of Florida rock phosphate.

Gypsum Plant Expansion

NATIONAL GYPSUM CO., Buffalo, N. Y., recently completed expansion of its Savannah, Ga., board plant, which included a change-over in its drying operations, from steam process to a direct oil fire method. The change-over, together with installation of some new mill units, is expected to increase plant production by over 25 percent. Cost of the expansion was approximately $1,000,000. Capacity has been increased several times since the plant was established in 1939. About 225 persons are employed, with an annual payroll of $750,000. John J. Burns is plant manager.

Silver Anniversary

KAISER-NELSON CO., Cleveland, Ohio, large sand and gravel producer and industrial steel reclaiming contractor, recently completed its 25th year in business. The company was originally founded as a sand and gravel business by Garrett W. Kaiser, president, and Hugh J. Nelson, vice-president. The steel reclaiming division was added ten years later when Joseph B. Horwitz, iron and steel broker, joined the firm as treasurer. Jack Bayer then became secretary. The company is currently engaged in the expansion and modernization of its plant and office facilities.

Safe-Driving Awards

KANSAS CITY QUARRIES CO., Kansas City, Mo., recently honored 25 of its truck drivers, at a special meeting and banquet, for completing 450,000 miles of driving in a 12-month period without an accident of any kind. Principal speaker at the meeting was Mr. Mossman, safety supervisor of the Riss and Co. trucking concern. Other features of the meeting included a film on safety, presentation of awards, and a barbecued chicken dinner.

This company has a policy of awarding the safe truck driver a cap after four consecutive months of driving without an accident, a shirt after eight months, and a pair of trousers, to complete the uniform, after one year of truck operation without any type of accident.

Opens Gravel Plant

MAHOMET SAND AND GRAVEL CO., INC., Mahomet, Ill., recently incorporated, has started operations at its new sand and gravel plant near Mahomet. Officers of the company are Carl A. Bays, president; Leslie D. Vaughan, vice-president and manager; Mrs. Lorraine W. Bays, secretary; and Ben Ellis, superintendent of operations.

Anti-Pollution Law

THE NEW YORK STATE Water Pollution Board reportedly has taken its first punitive action in the five years of its existence to enforce anti-pollution laws. The board recently served an order assessing Dunraven Quarries, Inc., Middletown, N. Y., $500 for failure to obtain approval of plans for discharge of wastes from a quarry and stone-crushing plant. The company was also enjoined from discharging wastes from the plant into state waters until such plans have been approved.

Limestone Quarries

DEVELOPMENT of two limestone quarries in southeastern Ohio, one near Porter and the other at Wilkesville, was recently announced by W. H. Lowman, Athens, Ohio, who has leased the quarries. The Porter quarry has a 1500-ton weekly capacity, while the Wilkesville quarry has a capacity of 400 tons daily. Most of the production is being used for highway purposes, with some agricultural limestone being produced.

Opens Perlite Plant

NATIONAL GYPSUM CO., Chicago, Ill., recently began operation of its new perlite expanding plant at Fort Dodge, Iowa. The plant will also produce the company's new mill-mixed perlite plaster, "Gypsolite."

Plans Cement Expansion

THE WHITEHALL CEMENT MANUFACTURING CO., Philadelphia, Penn., recently announced a $2,400,000 expansion and improvement program for 1954, which will include new installations for handling raw materials in first stages of production; unloading station to handle incoming materials; unit coal mills for each kiln; and complete rebuilding of electrical facilities.

The company's plant, located at Cementon, Penn., produced 1,965,000 bbl. of cement last year, 61,000 bbl. more than the previous high record set in 1929. Shipments in 1953 amounted to 1,948,000 bbl., or 25,000 bbl. less than the 1929 shipment record. R. A. Wetzler, president, in discussing the outlook for 1954, stated, "Construction is headed toward another good year and is the bright spot in the current level of economic activity. This is particularly true of the Northeast, where our market lies."

Cement Outlook

HERCULES CEMENT CORP., Philadelphia, Penn., through D. D. MacBride, president, reported at the company's annual stockholders meeting, that increases indicated so far this year in volume of heavy construction are of unusual significance to cement producers, and he expressed his belief that a continuation of this trend promises high level demand for cement during the remainder of 1954.

Company stockholders have approved an increase in authorized common stock from 180,000 to 300,000 shares, $10 par value.

Acquires Trap Rock Firm

JOHN S. LANE & SON, INC., Westfield, Mass., has acquired the assets of L. Suzio Trap Rock Co., Southwick, Mass. Included in the transaction are a crushing plant, which has a 1200-ton daily capacity, and a trap rock quarry on Route 57 in the Provin Mountain area.

Idaho Phosphate

IDAHO'S LARGE DEPOSITS of phosphate ore will be further tapped when Monsanto Chemical Co. places its second multi-million-dollar electric furnace in operation at its Soda Springs plant. The new furnace will double the company's production of elemental phosphorus.

Buy Quarry

JOHN LUND QUARRY at Andrew, Iowa, has been purchased by Richard Romakel and Donald Felderman, Bellevue, Iowa. Crushed stone aggregates and agricultural limestone are produced at the plant.

New Dolomite Kiln

MARBLEHEAD LIME CO., subsidiary of Material Service Corp., Chicago, Ill., has started a new kiln at Thornton, Ill., for the production of clinkered dolomite, a refractory material used in the manufacture of high-grade steels.

According to Wallace E. Wing, president, Marblehead Lime Co., the Thornton plant will afford the best quality control ever attained in the production of clinkered dolomite. Special features of the plant include: A control system which permits one man to control, visually and manually, the entire operation; a specially engineered dynamometer drive system which controls the kiln's rotation speed, and accurately proportions the limestone, iron oxide and coal; an induced draft fan for top combustion efficiency; and a cooling system which produces a clinkered dolomite with improved storage qualities.

The two 250- x 9½-ft. kilns are each powered by a 100-hp. motor, and revolve at a top speed of 30 sec. per revolution. They were supplied by F. L. Smidth Co. The Marblehead Thornton plant also operates two smaller kilns which produce dolomite for the construction industry, glass manufacturing, oil purification and chemical uses. The Thornton quarry, owned and operated by the parent company, Material Service Corp., extends over 1200 acres and produces crushed and pulverized limestone at the rate of over 1000 t.p.h.

Marblehead Lime Co., established in 1885, is one of the oldest lime producers in the country. In addition to the Thornton plant, it operates plants at South Chicago and Quincy, Ill., and Hannibal, Mo. It became a subsidiary of Material Service Corp. in 1946.

Pavement Yardage

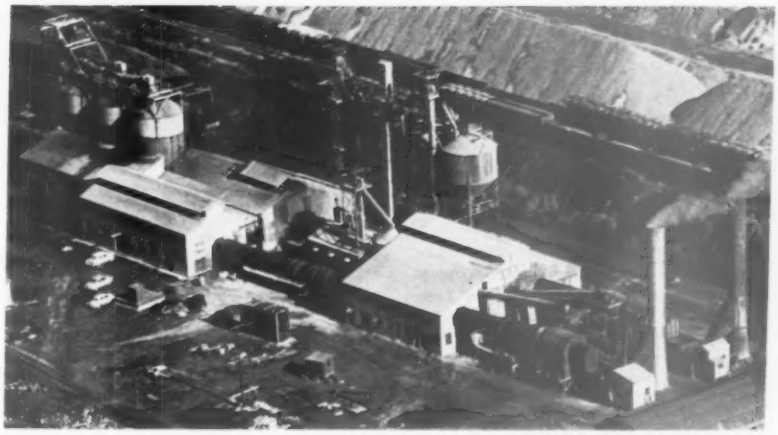
AWARDS OF CONCRETE PAVEMENT for the month of March are listed by the Portland Cement Association as follows:

	Sq. yd. awarded During March, 1954
Roads	2,649,132
Streets & Alleys	2,347,096
Airports	1,078,367
Total	6,074,595

Quarry Safety Awards

QUARRY EMPLOYES from Permanente Cement Co.'s Permanente, Calif., plant were honored recently at a dinner in San Jose, Calif., for their injury-free safety record which, for the second consecutive year, has won a national award from the U. S. Bureau of Mines. The 23 quarry workers were presented the "Sentinels of Safety" award for completing 141,779 man-hours in 1952 without a disabling injury. This safety record was also continued through 1953, with 162,300 man-hours of accident-free operation, a record now under consideration by the Bureau of Mines for the 1953 awards to be presented next fall. The Permanente quarry men have operated over 500,000 man-hours since July, 1950, without a lost-time injury.

J. Howard Bird, U. S. Bureau of Mines engineer in charge of the Pacific Coast region, was guest speaker at the dinner and presentation. Ed Collins, Jr., superintendent of industrial relations at the Permanente plant, was master of ceremonies. Other speakers included L. R. Flicker, safety engineer, and John Garouette, plant manager.



Shown above is the new 2-kiln dolomite plant recently placed in operation at Thornton, Ill., by Marblehead Lime Co., subsidiary of Material Service Corp., Chicago, Ill.

Advertising Stunt

HUNT LIMESTONE CO., Osceola, Mo., in a recent advertisement in a local newspaper, explained the use of soil tests as a basis for fertilizer applications as required for several of the agricultural conservation program practices for 1954. Included in the ad was a coupon, good for one soil test, courtesy of the agstone company.

Reopens Quarry

WEAVER CONSTRUCTION CO., Iowa Falls, Iowa, has reopened the old Hume Quarry near Bowling Green, Mo., on Highway 54. The quarry, which was closed down several years ago, was formerly owned by Concrete Materials Co., Bowling Green. Plant production includes concrete stone, road stone and agricultural limestone. Paul Bennett, formerly associated with Concrete Materials Co., is plant superintendent.

Opens Gravel Plant

BOEUF RIVER GRAVEL CO., has opened a sand and gravel plant along the Boeuf River, near Columbia, La.

Coming Conventions

June 14-18, 1954—
American Society for Testing Materials, 57th Annual Meeting, Sherman and Morrison Hotels, Chicago, Ill.

September 20-24, 1954—
American Mining Congress, Annual Metal and Nonmetallic Mining Convention and Exposition, Civic Auditorium, San Francisco, Calif.

October 20-22, 1954—
National Industrial Sand Association, Fall Meeting, Hotel Plaza, New York, N.Y.

October 28-29, 1954—
American Concrete Institute, Regional Meeting, Statler Hotel, Los Angeles, Calif.

Oct. 28-Nov. 2, 1954—
North Carolina Concrete Masonry Association, Annual Meeting, On Board Swedish Liner "Stockholm" to Bermuda.

January 9-13, 1955—
National Ready Mixed Concrete Association, Silver Anniversary Convention, Miami, Fla.

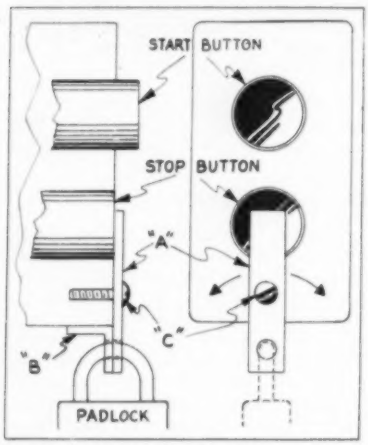
January 9-13, 1955—
National Sand & Gravel Association, 39th Annual Convention, Miami, Fla.

HINTS and HELPS

PROFIT-MAKING IDEAS DEVELOPED BY OPERATING MEN

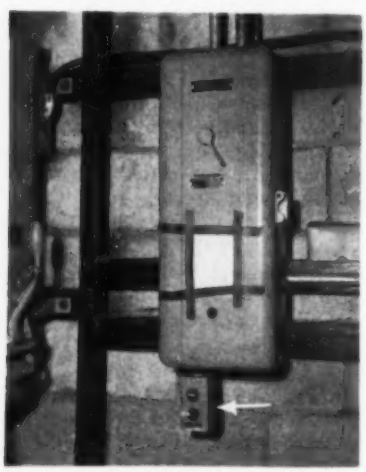
Safety Control Unit

AT A LIGHTWEIGHT AGGREGATE operation in the Southeast, an excellent method of insuring safe working conditions for the electrical maintenance crew was recently observed. On the small push-button control housing, a small clip-holder bracket had been



Sketch showing details of push-button safety control unit; side elevation is shown at left, with front view shown at right. "B" is a bracket permanently fastened to main switch supports; "A" is a clip fulcrumed at "C" so it can be moved as indicated. The clip can be locked so the push button is in the "stop" position, and the motor cannot be started until padlock is removed

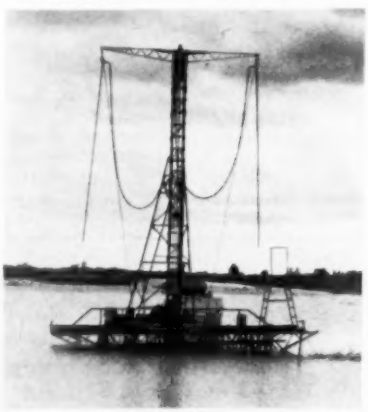
welded alongside the "stop" button. A clip was attached to the bracket so that it could be pushed over the button when in the "stop" position, thereby holding the button down all the time the clip was in place. This sliding clip was so designed that it could be locked in the "stop" position with a suitable padlock. The accompanying illustrations give the essentials of this safety control set-up.



Arrow points to sliding clip which can be locked in "stop" position with a padlock

Drilling Under Water

A FLORIDA CRUSHED STONE PRODUCER operates a quarry which is under a few feet of water at all times. Usually the water is shallow, so operations are carried on by use of a drill rig which has been mounted on a sled that is towed about the lake with a specially-designed tractor which can operate in 3 to 4 ft. of water. The drill on the rig is a rotary type, and the equipment includes a rotary Ingersoll-Rand compressor. The 30-ft. vertical mast is so designed that it can be moved easily about the deck of the sled, allowing five holes to be drilled without moving the sled. Holes are loaded as soon as drilled to prevent refilling with muck. Holes are shot once per day, using electric delays. During the rainy season when



Drill rig and compressor are mounted on sled which is towed by specially designed tractor that can operate in shallow water

the water is too deep to permit use of the sled and tractor, a barge which draws about 10 in. of water is used. The barge can be seen in the illustration to the left of the mast.

Fluidizing Coarse Aggregate

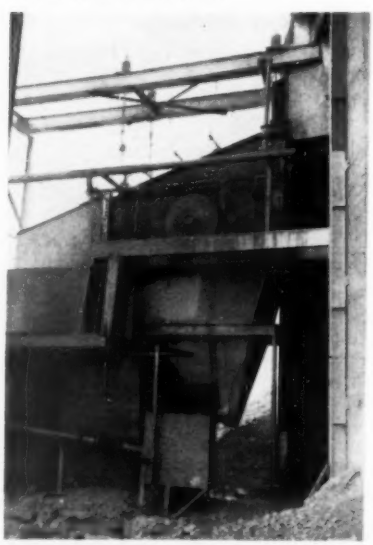
AT A SOUTHERN CRUSHED STONE OPERATION, two sizes of washed coarse aggregates are normally produced and stockpiled by individual stacker belts. Occasionally an odd-size material must be produced, in which case, the chute shown in the illustration is used. However, when material is first fed into this chute, it frequently bogs down. To get the flow started, a small amount of dry sand is shoveled onto

Flow of material in chute is facilitated by addition of small amount of dry sand which acts as fluidizing agent

the belt, along with the first stone going up the belt. The sand acts as a fluidizing agent. Once a definite flow pattern is established, the material flows without further trouble.

Crushing Wet Material

WET MATERIAL containing certain types of fines can be very difficult to crush. One operator installed a reciprocating feeder on a 4-deg. slope (down hill), which fed to a wet scalping screen. The plus fraction was free enough from fines to be crushed easily in the primary crusher, while the wash water and fines were pumped to the sand recovery plant by a 4-in. pump which is enclosed in the housing at the base of the cone.



Plus material is crushed in the primary crusher; wash water and fines are pumped to sand recovery plant

Concrete Block Steps

HOLLOW CONCRETE BLOCK can be used to make steps that are relatively cheap to install, are slip-proof and

Concrete block steps, installed alongside primary crusher at limerock operation, are placed with cored section acting as treads. Core space is filled with crushed limerock

that will last indefinitely. The steps shown in the illustration are at a Florida crushed limerock operation and are built alongside the primary crusher. The block, which are standard 8- x 8- x 16-in. cored units, are placed with the cored section acting as the tread, with the core space filled with crushed limerock.

Stand-by Engine Maintenance

By PAUL C. ZIEMKE

MANY PLANT OPERATORS find it advisable to install an engine-powered generator for stand-by purposes, in which a bare minimum of power will suffice to provide light and also power for the oil burner motors, and otherwise maintain skeleton electrical service in emergencies. Unless these engines are placed on a definite start-up routine, then when needed, they are apt to fail to start, either automatically or manually. Once-a-week routine start-ups are suggested for the best dependable service.

Following are some results of a series of tests and studies made in one plant: (1) Automotive leaded gasoline would not start a stand-by engine, started once a week, after one year—much of the volatile vapors had seeped out in that time; (2) white automotive gasoline of the non-leaded variety proved a little better, but was still unsatisfactory at the close of the year. (3) aviation grade 80 gasoline was substituted and the former starting troubles disappeared; (4) gasoline developed for winter use proved preferable to summer-type fuels; and (5) marine white gasoline was used successfully after long storage and proved to have a minimum of gum content.

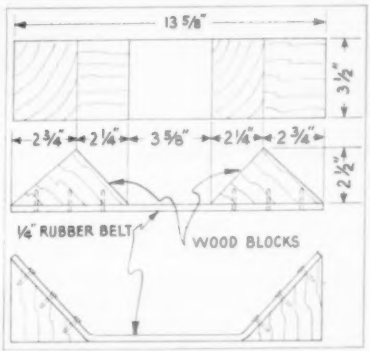
Both gum-inhibited white gasoline of aviation grade 80 or marine grade are recommended, plus weekly routine starting and also six months draining of the fuel tank. Monel fuel tanks are recommended over ferrous metal to eliminate the rust problem encountered from "sweating" due to atmospheric changes. Weekly starting also tends to minimize rust on moving parts and likewise keeps the starting battery well charged where no trickle charger is provided. The carburetor should be cleaned and adjusted at least once per season to prevent fouling of infrequently used small reciprocating parts.

Hauling Gas Cylinders

A SIMPLE BUT EFFECTIVE safety block for hauling oxygen, acetylene and similar tanks has been developed

Safety blocks, composed of triangular wooden blocks fastened to rubber belting, control roll of gas cylinders during transportation

by the Columbia Cement Division of Pittsburgh Plate Glass Co. The device was described by the safety and welfare director of the company's East Fultonham, Ohio, plant as an extremely effective gadget for controlling gas cylinders during transportation by truck.



Line drawing showing details of safety block for hauling acetylene and oxygen tanks. Note, by reversing belting, the block will automatically adjust itself to accommodate larger tank

This block is made by nailing two triangular wooden blocks, 2½ in. high and 3½ in. wide, on a piece of rubber belting, 3½ in. wide and 13⅝ in. long. When the belting is on the bottom, it fits a standard size tank. By turning the belt over, it automatically adjusts itself to fit larger size tanks. It is believed that this idea has merit and possible application other than in transportation of gas cylinders.

Long Apron Feeder

WHERE MATERIAL IS STOCKPILED alongside the primary operation, it is an advantage to have a longer apron feeder than conventionally used so that the reclaiming clam-shell (shovel or dragline) can operate more efficiently. It eliminates delays in dumping, thus speeding up operations. The illustration shows a 20-ft. long apron feeder which receives material from both trucks and the clam-shell rig.

Long apron feeder speeds up operations by avoiding delays in dumping

NEW Machinery

Conveyor Hold-Back

STEPHENS-ADAMSON MANUFACTURING CO., Standard Products Div., Aurora, Ill., has developed the "S-A" enclosed roller type hold-back, designed

Hold-back is designed to prevent reversal of bucket elevators and conveyors due to power failure under load

to prevent reversal of bucket elevators and inclined conveyors due to power failure under load. It mounts directly on the drive shaft, and consists of an inner member with wedge pockets for six hardened rollers. The unit rotates with the shaft and, when the shaft begins to reverse, the rollers wedge against an outer cylinder. Pressure springs and plungers are used to provide engagement of the rollers. When forward shaft motion is resumed, the hold-back releases. Maximum torque resistance ranges up to 350,000 in. lb. for units with a maximum bore of 7 in.

Hydra-Matic Trucks

GENERAL MOTORS CORP., Truck & Coach Div., 660 South Blvd., E., Pontiac 11, Mich., has extended Hydra-Matic drive to its medium and heavy-duty trucks and highway tractors. These are the M350-24 and M350-27 two-ton models; M400-27, which hauls a gross combination weight of 30,000 lb.; the M450-30 with a 35,000-lb. gross combination weight; and the M470-30, which hauls a 45,000-lb. gross combination weight. Another Hydra-Matic model is the one-ton package delivery truck which supplements the light-line Hydra-Matic trucks. The drive is an eight-speed transmission with a two-speed reduction unit, designed to eliminate engine lugging and overspeeding. Power steering is available as optional equipment on the two-ton models and up. Swinging front access doors are utilized on the heavy-duty, cab-over-engine models, which have a 72-in. cab dimension. The heavy-duty line features a conventional 660-50 four-wheel, lighter-weight replacement for the 740 and 750 series. It has a 200-hp. 503-cu. in. engine, five-speed transmissions and two-speed or double reduction rear axles. The six-wheel conventional and cab-over-engine models, except the 950 and 970, have 8- and 10-speed Fuller Road Ranger transmissions as standard equipment for greater flexibility in tractor and truck wheelbases.

Motors-N.E.M.A. Frames

A. O. SMITH CORP., Electric Motor Div., Milwaukee 1, Wis., has announced a line of integral horsepower motors, designed to provide a changeover to the new N.E.M.A. standards. The motors are available in either present or new mountings to avoid machine remodeling. Performance characteristics of the line are the same as in the previous models, as well as contour lines and styling. The physical mounting dimensions vary according to requirements. The motors are available in 1-, 1½- and 2-hp. ratings. The design has a rolled steel main frame construction with an attached malleable iron base mounting as required. End frames are of cast iron. Rotor diameter fans are employed, and the blades are integrally cast with pressure cast end rings and rotor bars. The line is available in the 203, 182, 204 and 184 frames with the standard horsepower ratings in these sizes.

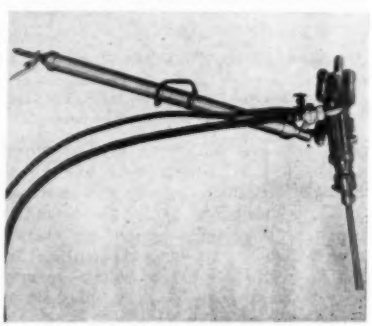
Rope Crowd Shovel

AMERICAN HOIST & DERRICK CO., 63 S. Robert St., St. Paul 1, Minn., has brought out an alternate rope crowd front for the Model 375 ¾-cu. yd. shovel, featuring a box section type boom with large diameter boom point sheaves and a wide rugged cast steel boom foot. The dipper pitch angle can be changed by removing one pin and replacing it at another angle. The single rigid dipper stick is designed for heavy-duty digging operations.

Shovel features alternate rope crowd front with single rigid dipper stick

One-Man Air-Leg Drills

GARDNER-DENVER CO., Quincy, Ill., has announced two lightweight, one-man air-leg drills, incorporating the Series "8" rock drills. Model FL48 carries a 2½-in. bore drill and weighs 79 lb. with a 4-ft. feed leg. Model FL58 carries a 2⅝-in. bore drill and weighs 87 lb. with a 4-ft. feed leg. Either model is available with a 2-, 3-, 4-, or 5-ft. feed travel. A detachable feed leg extension provides extra length when needed. Air is fed to the



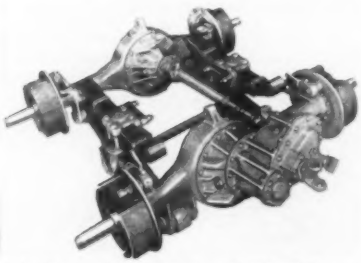
Drill has a detachable feed leg extension to provide extra length when needed

feed leg through the swivel connection, thus requiring one air hose. Air and water hoses are located on the right side, opposite the drill runner's most common position. The drill and feed controls are grouped in one location on the drill backhead, with detents to prevent the throttle control handle from crawling from set positions.

A "push-button" bleed, in the "D" handle, is said to assure full feed control when holes are being collared, or the leg is being reset. When the push button is depressed, live air to the leg is shut off and the air in the leg is exhausted. Turning the drill throttle valve to "off," or turning the air-feed leg pressure control valve to "off" also exhausts air from the feed leg. An air-operated water gland automatically provides the "water on, air on, air off, water off" cycle. The gland and tube may be removed without removing the drill side rods. Constant blowing from the chuck end is said to keep water and cuttings from entering the drill, even when drilling up holes.

Tandem Axle

EATON MANUFACTURING CO., Cleveland, Ohio, has introduced the Model 32M tandem axle with a load capacity of 32,000 lb. on the rear tires at the ground. An inter-axle differential in the power divider is said to



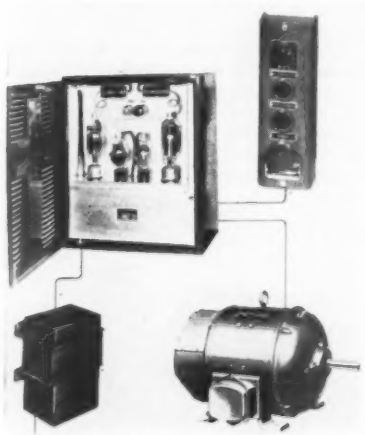
Axle has a load capacity of 32,000 lb. on the rear tires at the ground

assure equalized power transmission to the driving wheels even though the wheel speeds may be variable due to road irregularities or differences in tire diameter. A 100 percent positive differential lock between the forward and rear axles is designed to provide maximum traction under unfavorable road conditions.

Adjustable-Speed Drive

THE LOUIS ALLIS CO., Milwaukee, Wis., has introduced a stepless adjustable-speed drive, the Electronic Select-A-Spede, designed for operation from a-c power lines, and available with d-c drive motors in standard N.E.M.A. frame sizes, ¾ to 15 hp. The unit is especially designed for applications where flexibility and close speed control are necessary, such as for test equipment, conveyors, welding positioners, etc.

Advantages claimed for the drive include: precision speed control; wide speed range where required; and adaptability to a variety of optional electrical and mechanical modifications. The complete unit consists of an anode transformer, electronic control panel, pushbutton station, and a specially-designed adjustable-speed d-c drive motor. The transformer and control panel may be mounted in any convenient out-of-the-way location, with the drive motor and pushbutton station available in open, drip-proof, splash-proof, totally-enclosed, or explosion-proof enclosures. Standard safety features include a "fail-safe" circuit in case of tube failure, and a current-limit control to safeguard the driven machine and motor from overload, jamming or too rapid acceleration. The unit is built with speed ranges of 5:1, 20:1, or 50:1, with 100:1 available for some applications.



Drive is designed for applications where flexibility and close speed control are needed

Additions to Truck Line

FORD MOTOR CO., Ford Div., P. O. Box 638, Dearborn, Mich., has announced the addition of Series T-700 and T-800 tandem axle trucks to its line. In the T-700, a choice of either a 138-hp. OHV V-8 Power King or 152-hp. OHV V-8 Cargo King engine is offered. The T-800 truck is powered by a 170-hp. OHV V-8 Cargo King engine with high compression and low friction design. Both trucks are available with power steering.

The T-700 is suitable for a 3½-cu. yd. concrete mixer, a 5- or 6-cu. yd. dump truck or an oil tanker. The T-800 is rated to carry a 5-cu. yd. mixer or a 10-cu. yd. dump. Both trucks are designed for off-road as well as highway operation. The load

Series T-800 tandem axle truck handles payloads (with body) up to 29,943 lb.

weight is distributed from frame to springs at four points to prevent single-point stress concentration, and rubber bushings at 10 wear points of the torque arms and equalizer beams are said to reduce shock and eliminate lubrication needs. Wheelbases in the T-700 series are 144, 156, 175 and 192 in. with a maximum gross vehicle weight of 27,000 lb. and a maximum gross combination weight of 42,000 lb. Rear tandem rating is 22,000 lb. The wheelbases of the T-800 are the same as the T-700 with a maximum gross vehicle weight of 40,000 lb., and a maximum gross combination weight of 60,000 lb. The rear tandem rating is 32,000 lb. An auxiliary transmission is available on all wheelbases.

Two cab forward series have also been added, the C-700 and C-900 "Big Jobs." The C-900, has a maximum gross combination weight rating of 55,000 lb. Master-Guide power steering is available on these models, as well as a "de-popper" valve which is designed to utilize the engine vacuum to prevent downhill backfiring. Closer coupling is said to add up to 2 ft. more of load space, and the extra weight is shifted from the rear to the front axle for balance and maneuverability in traffic.

Loader Attachments

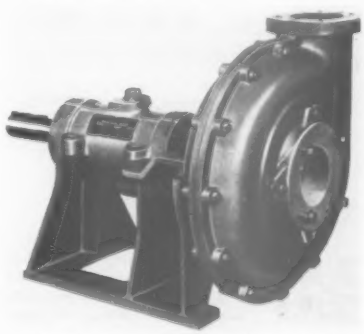
THE MIXERMOBILE MANUFACTURERS, Portland, Ore., has brought out five attachments to increase the job flexibility of Scoopmobile Model LD10 and LD5 front-end loaders. These include lift-forks, backfill blade, crane boom, concrete hopper and a dozer blade. The lift forks, backfill blade and concrete hopper mount directly on the hydraulic boom, replacing the scoop

Lift fork has a capacity of 7000 lb. to a height of 13 ft. on the LD10, and 5000 lb. to 11 ft. on the LD5

and using standard fittings for fast change-over. The dozer blade, for Model LD10 only, attaches directly to the chassis, the bucket remaining on the boom. Both models feature four-wheel planetary drive, four-wheel power steering, all hydraulic operation and Pow-R-Flex coupling of two separate power axle elements to provide twist-turn flexibility.

Abrasive Solution Pump

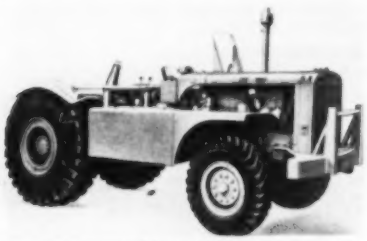
THE ALLEN-SHERMAN-HOFF PUMP CO., Wynnewood, Penn., has developed the "Centriseal" pump for pumping undiluted abrasive or corrosive solutions, and which is designed to operate without sealing water. Its pumping parts are protected by moulded "Maximix" rubber, and the stuffing box, packing gland and shaft sleeve are tailor-made of resistant alloys for pumping acids. The mechanical parts of the unit are interchangeable with those of the anti-friction-bearing type of "Hydroseal" pump.



Pump operates without sealing water

Four-Wheel Tractor

CATERPILLAR TRACTOR CO., Peoria, Ill., has brought out the DW15 four-wheel tractor, powered by a six-cylinder D326 diesel engine, producing 150-hp. at 1800 r.p.m. with a 5⅛- x 6-in. bore and stroke. The standard transmission gives double speed ranges, with 10 forward speeds up to 24

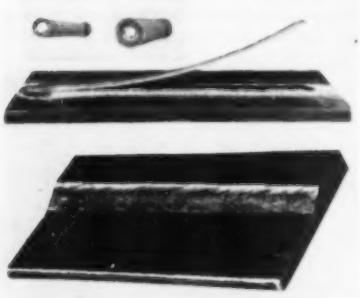


Tractor is powered by a 150-hp. diesel engine

m.p.h., and two reverse speeds up to 3.3 m.p.h. Optional final drive gears provide speeds up to 31.3 m.p.h. The wheel brakes are foot pedal controlled and have compressed air boosters. When the brakes are applied, those on the pulled unit are actuated automatically just before the prime mover brakes take hold, to insure anti-jackknife protection. The flywheel clutch has an adjustable snubber arrangement designed to minimize rebounds and provide operator comfort. A 75-gal. fuel tank will hold enough fuel for a full day's operation. The tractor is designed principally for use with the Cat No. 15 scraper, No. 10 scraper and W10 wagon, and includes wagon controls and a windrow breaker. Overall length of the tractor is 16 ft. 8 in., and the wheelbase is 121½ in.

Powdered Metal Electrodes

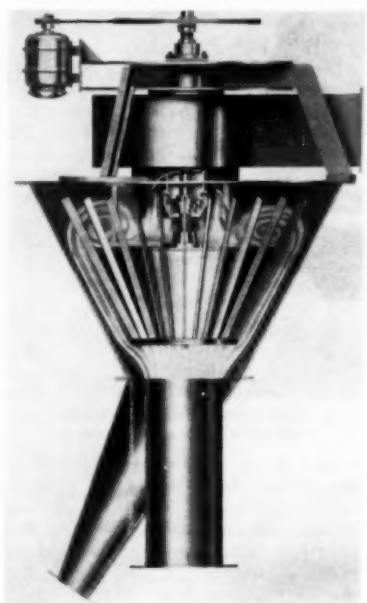
THE LINCOLN ELECTRIC CO., 22801 St. Clair Ave., Cleveland 17, Ohio, recently developed electrodes with powdered metal coatings which use the excess heat available in the arc to increase welding speeds. The powdered metal in the coating is melted by this heat and becomes an additional source of metal for the weld. The difficulties of excess current, spatter, gouging, and undercutting are said to be minimized and additional metal is available to make full welds at the higher speeds. If an electrode contains sufficient iron powder in the coating to supply one-third of the deposited metal from the coating and two-thirds from the core wire, it is said to deposit metal 50 percent faster than the same electrode without iron powder in the coating. These electrodes are also said to raise the limit on welding speeds imposed by the current carrying capacity of the core wire, provide more metal for deposition, and use the arc heat more efficiently.



Top: Partially used conventional electrode at left, electrode with powdered metal coating at right. Center: Slag formed from powdered metal coating has lifted itself from the bead as it cooled. Bottom: Horizontal lap weld in ¼-in. plate with a ¼-in. dia. electrode

Air Classifier

HARDINGE CO., INC., 240 Arch St., York, Penn., has developed the "Gyrotor" air classifier for use in continuous separation of coarse and fine air-borne particles. It can be used in closed circuit with a pulverizing mill or as a self-contained sizing unit for a moving stream of air-solids mixture. The classifier is basically an inverted,



Classifier can be used in closed circuit with a pulverizing mill or as a self-contained sizer

truncated-cone shell with a motor-driven, bladed rotor of similar shape revolving on a vertical center axis inside the outer shell. The raw mixture of coarse and fine air-borne material is fed in from the bottom of the cone, passes upward in the annular space occupied by the whirling blades, and discharges through a central opening in the top. Oversize, not removed by the impact of the blades, drops out in the eddy current above the rotor and, centrifugal action deposits it on the outer shell of the classifier, where it slides to the oversize discharge at the base of the shell. The returning oversize is cleaned of fines due to the winnowing action of the rotor blades. The classifier has a wide range of fineness control, and adjustment of product size is made by changing the rotor speed.

Portable Conveyor

KOLMAN MANUFACTURING CO., Sioux Falls, S. D., has introduced the Model 101 heavy-duty, portable conveyor in 18-, 24-, 30- and 36-in. belt

Heavy-duty 36 in. wide portable conveyor carries an 8-ft. x 48-in. vibrating screen

widths and various lengths. It carries an 8-ft. x 48-in. vibrating screen which is supported by the conveyor during operation and need not be removed during transportation, due to a "folding feature." Conveyor features include a self-cleaning tail pulley, a bar type, self-lagged head pulley, anti-friction bearings, a choice of greaseless or regular ball bearing idlers, pneumatic tires, a separate clutch for individual operation of the vibrating screen and conveyor belt, hydraulic hoist with "V" type carriage trucks for low road clearance, and a self-cleaning steel belt cover. Single and double deck vibrating screens of different sizes are available, taking power from the conveyor. A gravel trap or hopper can be added to the conveyor tail section for either dozer or shovel loading.

Heavy Duty Dump Truck

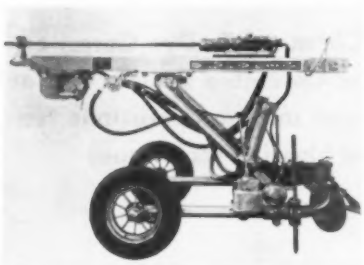
DART TRUCK CO., Kansas City, Mo., recently added Model 10-S to its line of heavy-duty trucks. The heavy-duty truck is powered by a 6 cyl. Continental Rd6572, 156-hp. diesel engine. Maneuverability in close quarters has been provided by designing the truck on a 100-in. wheel base, with a turning radius of less than 20 ft. The truck features front end suspension, and utilizes a box section frame, the same type as used on ore-hauling trucks. It has six rock, lug type 16

Heavy duty truck is powered by a six cylinder, 156-hp. diesel engine

ply tires, and the twin 6-in. dia., double acting, single-stage hoist which raises to a 60 deg. dumping angle, is said to dump in 10 sec.

Wagon Drill

GARDNER-DENVER CO., Quincy, Ill., has brought out the Model URM wagon drill incorporating a Model UMH



Drill has dual hydraulic lift and 4-in. drill

drill wagon with two hydraulic lifts, a heavy-duty 4-in. drill, and an RM chain feed. The dual hydraulic lift raises or lowers the U-bar while the drilling mast is being maneuvered into position. The drill is said to combine a fast hammer action, steady rotation of the steel, and hole cleaning at full line pressure. A single drill control handle, located within the operator's reach on the chain feed, controls the drilling, blowing and hole-cleaning operations. The unit handles 8-ft. steel changes as standard.

High Capacity V-Belt

RAYBESTOS-MANHATTAN, INC., Manhattan Rubber Div., Passaic, N. J., has introduced the R/M Super-Power V-belt, which is reported to provide 40 percent greater horsepower capacity on existing drives. The belt construction is of synthetic rubber, and is designed to be oil-proof, non-spark and heat-resistant. Its performance advantages parallel those claimed for the Condor V-belt.

Shovel-Crane

AMERICAN HOIST & DERRICK CO., St. Paul 1, Minn., has announced the Model 750 shovel which is rigged for crane, clamshell, dragline, shovel and backhoe operations. As a shovel or backhoe, rated capacity is 1½ cu. yd., as a crane, 35 tons, and it will handle a 2-cu. yd. clamshell or dragline. The shaft assemblies are single purpose,

Shovel is rigged for crane, clamshell, dragline, shovel and backhoe operations

each of which can be removed without disturbing another. Multiple tooth involute splines are used to further facilitate assembly and disassembly. The air controlled clutches are of a contracting band type, and anti-friction bearings are utilized in the brake linkage, as well as throughout the unit. The car body, roller path and bull gear are integrated in a heavy steel casting, and bevel drive gears are enclosed running in oil. Steering is accomplished by means of multiple jaw type clutches, designed to operate even when the crawler base is submerged in water as there are no bands to soak or slip. The crawler shoes are of alloy steel, double wall design for heavy-duty use. The crawler side frames slide in on axles for minimum road and rail clearances, or they can be removed along with the counterweight and front end attachments to reduce load weights for over-road trailer hauling.

Heavy-Duty Tractor

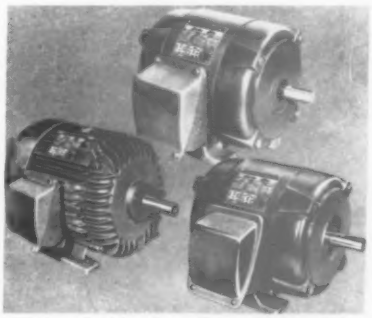
CATERPILLAR TRACTOR CO., Peoria 8, Ill., has announced several improvements in the Cat D-2 tractor providing an increase in drawbar horsepower from 32 to 35 and belt horsepower up to 42. The heavier model is said to be capable of pushing or pulling close to 8000 lb., and the total tractor weight has been increased to

Tractor has 35 d. hp., and two additional track sections

approximately 525 lb. Overall length has been increased 6⅛ in., and two additional track sections have been added. The flywheel clutch may be removed without disturbing the engine, due to the increased length. The seat is moved forward for access to the rear of the steering clutch case. Other improvements in the "long" D-2 include a track carrier roller and heavy-duty fenders as standard equipment, and an under-the-seat tool box.

Induction Motors

WESTINGHOUSE ELECTRIC CORP., 401 Liberty Ave., Box 2278, Pittsburgh 30, Penn., has brought out "Life-Line-A" induction motors conforming to N.E.M.A. standard dimensions, and available in three enclosures: totally-enclosed fan cooled; totally-enclosed non-ventilated; and drip-proof. Wire, coil, dip and cable insulations are designed for high thermal endurance, dielectric strength, and long service life. The ventilation system on the



Totally-enclosed fan-cooled, totally-enclosed non-ventilated, and drip-proof motors

drip-proof motor is a straight through design with the ventilation openings located in one quadrant of the rim of the end bracket to protect the motor from overhead drippings. The totally-enclosed fan-cooled motor has radiating fins to utilize the available area for heat dissipation. The blower fan on this motor is of molded glass plastic for protection in contaminated atmospheres.

The motors feature two seals on each side of the bearing, an inner seal and an outer seal, the inner one being stationary and functioning merely as a seal. The outer seal rotates and is attached to the inner bearing race, acting as both a seal and flinger to throw off foreign particles which may enter the bearing. The totally-enclosed motors are equipped with a bearing by-pass to prevent the motor from breathing through the bearing by equalizing the pressure on each side of the bearing. The frames are of cast iron with corrosion-resistant finishes.

Bag Flattener-Unloader

FLEXOVEYOR MANUFACTURING CO., 1220 S. Acoma St., Denver 10, Colo., has announced a box car and truck unloader with a bag-flattening attachment. The unloader carries bags on a flexible spring conveyor and hugger boom sections, which flattens each bag for storing in minimum space. It is powered by a 1½-hp. gearmotor, which also drives the flattener, and runs at a speed of 120 f.p.m., delivering 1000 bags per hr. The flexible section of the conveyor is equipped with side rails which guide the bags into the flattener. The discharge end is equipped with a hydraulic jack for raising and lowering to load pallets.

Box car and truck unloader features a bag-flattening attachment

Primary screen house with conveyor to the left bringing stone from mine. Two inclined belt conveyors on right carry small stone to bins or to commercial plant for processing. Third conveyor loads large stone to cars for rail shipment

SOLVAY Mines High-Limestone for Chemical

Solvay Process Division, Allied Chemical & Dye Corp., enlarges operations taken over from Columbia Quarry Co., at Prairie du Rocher, Ill. Underground mining operations feature specialized drilling and blasting techniques

By BROR NORDBERG

AN UNUSUAL ARRANGEMENT was completed in 1948 when Columbia Quarry Co., St. Louis, Mo., sold its property and limestone crushing plant at Prairie du Rocher in southern Illinois to the Solvay Process Division, Allied Chemical & Dye Corporation. Solvay had practically exhausted its source of limestone at the Winfield, La., quarry, and was faced with the problem of obtaining a source of high calcium limestone to be calcined in vertical kilns for the manufacture of soda ash at its large plant in Baton Rouge, La.

The limestone deposit at Prairie du Rocher is near the Mississippi River some 50 miles south of St. Louis, more than 600 rail miles from Baton Rouge. It is a limestone of medium hardness readily burned into lime, in excess of 95 per cent $CaCO_3$, and is unusually white in color. Columbia Quarry Co. had operated a plant at Prairie du Rocher since 1939 for the production of various commercial crushed stone products and agricultural limestone. The properties of the stone were such that many specialized stone products, like grit, in the finer size ranges were produced. Columbia had opened a mine about 80 ft. up from the bottom of the bluff in which the stone occurs in order to mine the lighter colored, low impurity grade of stone for the production of glass rock.

Solvay Process Division was solely interested in producing kiln stone within the size range of 1- or 1½-in. up to 5-in. maximum for calcining in vertical kilns at Baton Rouge. Accordingly, a contract was concluded whereby Columbia Quarry Co. handles the sales of all stone products produced to various size ranges smaller than 1 or 1½-in. top size. The products include concrete aggregates, road stone, agricultural limestone, grit sizes and others.

With this arrangement, production is scheduled insofar as practicable to meet Columbia's requirements for sale. Should its demands require, stone up to 1½-in. top size is processed into commercial sizes; otherwise the upper limit might be 1 in., in which case 1 to 5 in. size is shipped by rail to Baton Rouge. The plant has operated under this plan continuously since the purchase in 1948, but in the 1952-1953 period capacity has been more than doubled to conform with increased demands for kiln stone.

Limestone being mined is of the Salem formation, occurring in a big bluff some three miles in length and paralleling the Mississippi River which is several miles distant. The bluff has a face standing as much as 300 ft. above the surrounding terrain and is covered over, above, with good farm land sprinkled with sink holes and small ponds.

Mine entrances were originally driven into the face at a level about 80 ft. higher than the surrounding area and railroad tracks, in order to mine out the lighter colored stone. Below that level the calcium carbonate decreases somewhat. Though there is much good stone in the lower levels, it varies in chemical composition whereas that in the upper levels is very uniform. Salem stone extends up to the original mine level.

There are two main mine entrances and a nearby exit for taking out stone, through which adequate ventilation is obtained. Workings have been extended into the bluff a distance of about 1400 ft. from the mine openings.

The original plant had a primary crusher just inside the mine exit and there were screens just outside, and then the commercial plant which still is in use. Since Solvay took the plant over, mining operations have been greatly extended and further mechanized, with development of a higher face in anticipation of enlarging production. The setup was increased the past two years, and in the 1952-1953 period, crushing and screening capacity were greatly enlarged.

A new large-capacity gyratory crusher was installed in the mine, some 800 ft. from the entrances, in order to reduce the hauling distance from the working faces and to centralize operations. A long belt conveyor transfers the stone outside the mine to a new primary crushing and screening plant. This is an imposing structure, 95 ft. in height, of structural steel construction and completely enclosed with asbestos-cement siding. Heavier and larger capacity vibrating screens and larger belt conveyors were installed. The structure is equipped with dust collectors.

Aerial view of office and shop building

Calcium Use

Electric shovel loading stone into large capacity haulage unit

Production capacity is about 4500 tons of stone per day. Kiln stone is chuted onto a belt conveyor for direct loading of cars. There is no provision for stockpiling except at destination. Certain commercial stone sizes are conveyed directly into a railroad loading bin and other small stone is transferred to the separate and original commercial stone plant for further sizing and reduction if required.

Mining

The mining operation has been highly mechanized. Solvay has lowered the floor and the ceiling. Presently the workings are to a 28-ft. ceiling as compared to 18 to 20 ft. with rooms 50 ft. in width; using a square cut pattern of development. Pillars measuring 55 x 40 ft. are being left to support the roof amounting to 24 per cent of the stone. Later, the mine floor will be lowered an additional bench cut.

For the purpose of record-keeping and as an aid to development, the roadways perpendicular to the face are lettered from A to Z. The main avenue is designated as "Main Street" and parallel roadways are identified as North A, North B, etc., to the north and South A, South B, etc., to the South. Roadways parallel to the face of the bluff are numbered in sequence.

The formation is massive with few seams or parting planes that might be used in establishing the floor or ceiling. Practice is to work three faces simultaneously, working a particular heading and adjacent cross-cut together to cut down on the moving of equipment per blast.

Drilling is done horizontally into each face, using the V-cut method with holes starting at the floor and spaced equally apart up to the ceiling for each column of holes. On either side of the V-cut are five columns of such drill holes. Spacing is 3½ ft. horizontally and 5½ ft. vertically, with a total of 96 holes per blast.

Drilling equipment consists of four wagon drills for drilling bench holes, two drills mounted on truck rigs and two Jumbo drill rigs, each of which mounts three Hydro-drill jibs. All the drilling equipment is of Joy manufacture, pneumatically-operated from lines to compressors in the powerhouse outside the mine. All drills are 3½-in. pneumatic drifters which finish 1⅝-in. holes.

Holes are drilled a depth of 12 to 15 ft., to progress 12 ft. forward in bringing down 1200 tons of stone per blast: The holes are stemmed with stone dust in paper bags and are detonated from the V-cut. Following instantaneous detonation of the V-cut holes, the columns of holes on either side, progressively to the outside of the face, carry one higher interval of delay each.

Until Solvay took over this plant, its experience in crushed stone production had been limited to open quarries at Jamesville, N. Y., Detroit, Mich., and Winfield, La. Prairie du Rocher was the company's first mining venture which makes its choice of drilling, powder loading and scaling equipment of particular interest. The two Jumbo drilling rigs are of original design and were built by the company at Baton Rouge. They are self-propelled by gasoline engine on rubber tires and mount three drills at the same level on a platform. The platform is raised or lowered by cable, actuated by an airhoist. These rigs are of sturdy construction and very maneuverable. Single wagon drills are truck-mounted for flexibility.

The powder rig is also self-propelled, consisting of a raisable platform on a framework mounted on the back of a truck. Particular attention is paid to scaling of the ceilings and walls, after every shot, before drilling and before loading operations start. Two Wagnermobiles are used for the purpose. As shown in the accompanying illustration, they are commercially-built, truck-mounted scaling rigs, the framework being of telescopic construction so that the working platform may be quickly raised or lowered to the desired height. These particular units have a range of 62 ft. vertically, in four telescopic lifts.

Blasting is done at the end of each shift. Electricity for all requirements and lighting is generated in the company's own powerhouse.

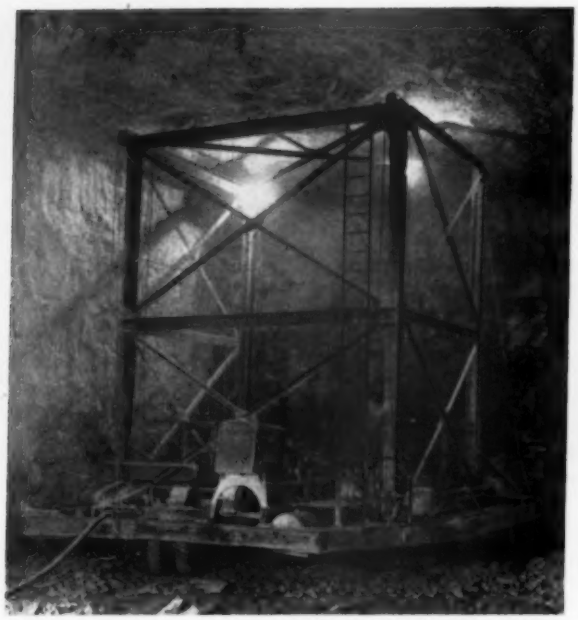
Crushing and Screening

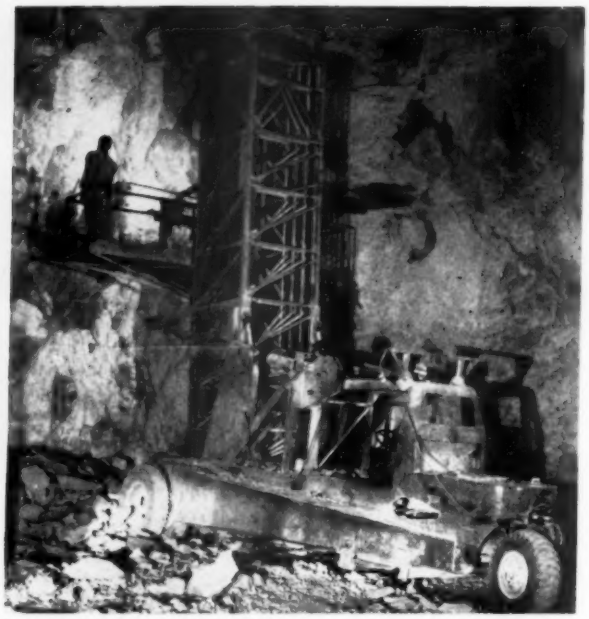
Three 2½-cu. yd. Marion crawler-mounted electric shovels, of which two have Ward-Leonard control, load the stone into diesel-powered end-dump Euclid trucks for the haul to the crusher. There are eight trucks, hauling 18 to 20 tons of stone to the load. They discharge into a hopper over a 42-in. Allis-Chalmers, Superior-McCully gyratory crusher. The crusher is set for a 5-in. opening. It discharges over an apron feeder through a chute onto the main 36-in. belt conveyor out to the new screening plant. This is a distance of 800 ft.

The new primary screen house was erected against the face of the bluff. Crusher-run stone is divided over two 5- x 16-ft. Seco double-deck vibrating screens with 3-in. and 1½-in. sq. openings on the top and bottom decks, respectively. The discharge box ahead of these screens has a system of steel bars projecting through, which are the means of regulating the proportionate flow of stone to each screen. Normally, there is an equal division.

Oversize from both screen decks is kiln stone which is dropped to ground level through a steel chute which is off zig-zag design to retard the rate of flow. Transfer below is to a horizontal belt conveyor which loads into railroad cars.

Minus 1½-in. stone from both primary screens is re-screened over one 5- x 16-ft. Seco double-deck vibrating screen with 1-in. and ⅝-in. sq. openings on the top and bottom decks, respectively. Plus 1-in. stone (1-1½ in.)





Left: Jumbo drill mounted on pneumatic tires. Right: Telescopic scaling rig

can discharge either into the kiln stone chute or be put into a commercial stone bin. The ⅝- to 1-in. product (road stone) is discharged into a second bin, and minus ⅝-in. stone into a third.

The 1-1½-in. size may be drawn from its bin and fed by a Syntron vibrating feeder to an American hammermill for further reduction, and then transferred by 24-in. belt conveyor to the commercial stone screening plant for sizing. Minus ⅝-in. stone is usually transferred over the same belt conveyor to that plant. Either product from the primary screening plant can be diverted by a 24-in. belt conveyor to a "railroad" bin for loading cars, or from which the stone may be drawn for stockpiling by truck, should the commercial plant be down.

The vibrating screens and the hammermill in the primary screening plant are vented by a Buell dust collector which automatically discharges dust on to the belt conveyor carrying stone to the commercial plant. Spillage from the primary belt conveyor head pulley is diverted by chute to the secondary vibrating screen. The primary screening plant, being 95 ft. high, is served by a manlift.

The "commercial stone" plant has gone unchanged. It receives its stone by belt conveyor from the primary screening plant. Screening is done over two 5- x 10-ft. Niagara double-deck vibrating screens and two 4- x 8-ft. Stephens-Adamson double-deck vibrating screens. Oversizes may be crushed through two 30 x 14 American hammermills, and the product re-screened in the production of agstone

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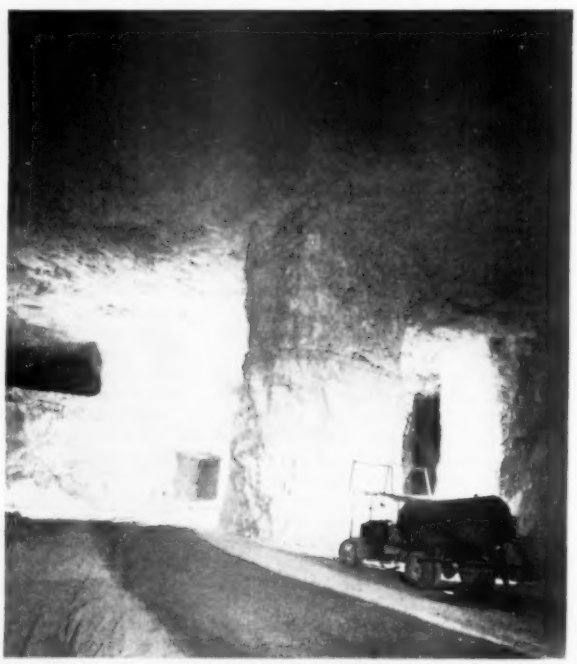


Left: Powder rig with elevated platform raised to highest point. Right: Interior view of mine showing stone pillars left in place to support roof

Laboratory Tests Prove

Cements Are Better

By E. L. HOWARD*

"AND THERE BEING BUT LITTLE TIMBER in the land the people became exceedingly expert in the working of cement; therefore they did build houses and temples of cement." This quotation from Hagath's Time concerns the year 46 B. C. and the country of Guatemala. In the years since Hagath much has been forgotten about his cement. But some things have been learned about Mr. Aspdin's invention, portland cement.

Five years ago we established water-cement ratio tables for several brands of cement. The standard A.C.I. tables were adjusted for use by data obtained from our own tests. These tables now seem to be quite conservative. The present study will result in new curves and tables for design more in line with the actual strength yield of cements now available.

We tested five brands of cement in laboratory-made concrete. The batches were designed to include three water-cement ratios. Aggregates used in these tests came from the same source (Pacific Coast Aggregates—Eliot plant) as those used five years ago. The aggregates for the trial batches, and the cements were taken from commercial production.

A.S.T.M. methods were used in all testing and sampling. Twelve to 15 cylinders were taken from each laboratory batch. Concrete not used for cylinders was tested for unit weight, air content, and consistency (Kelly ball method). The field sampling and testing methods are unchanged for the five-year period considered here. Two parafine dipped paper molds are placed in a moisture-proof box. These molds are filled with the sampled concrete without being removed from the box. After 24 hr. on the job site, they are delivered to the laboratory where they are stripped and placed in the moisture cabinets and kept at 70 deg. F. until broken.

Data of aggregates used at batch plants in 1948 and 1953 show no significant differences. (Table 2) The brand of cement used in batch plants cannot be determined for all of the job-made tests reported in Fig. 2. The mix proportions, for Fig. 2 concrete are unchanged for the two years compared. Eight mixes used in this

(Continued on page 73)

*Testing engineer, Pacific Coast Aggregates, Inc., San Francisco, Calif.

TABLE I.—Mix data and compressive strengths of concrete made using several brands of cement and two admixes

Band Brand	W/C Gal./sk	Porp. by Wt.	Kelly Ball in. of pen.	Percent Air	Unit Wt. Lb./cu. ft.	Compressive Strength 7 day p.s.i.	90 day p.s.i.
A	6½	1-4.5	1.25	1.4	150	3810	6000
B	6½	1-4.5	2	2	150	2720	5600
C	6½	1-4.5	.75	1.5	151	2860	5200
E	6½	1-4.5	1	1	152	2860	5620
J	6½	1-4.5	1.5	1.5	151	3470	5620
A	7½	1-5.4	2.75	1.5	148	2850	5380
B	7½	1-5.4	1.25	2	149	2410	4900
C	7½	1-5.4	2	1.5	150	2040	4710
E	7½	1-5.4	2.5	1	151	2050	4900
J	7½	1-5.4	1	1.5	149	2570	4300
A	9	1-6.6	1.75	1.3	150	1790	3910
B	9	1-6.6	2.25	2	148	1570	3500
C	9	1-6.6	1.25	1.5	150	1670	3590
E	9	1-6.6	1.75	1	150	1210	3490
J	9	1-6.6	1.75	1	149	1720	3300

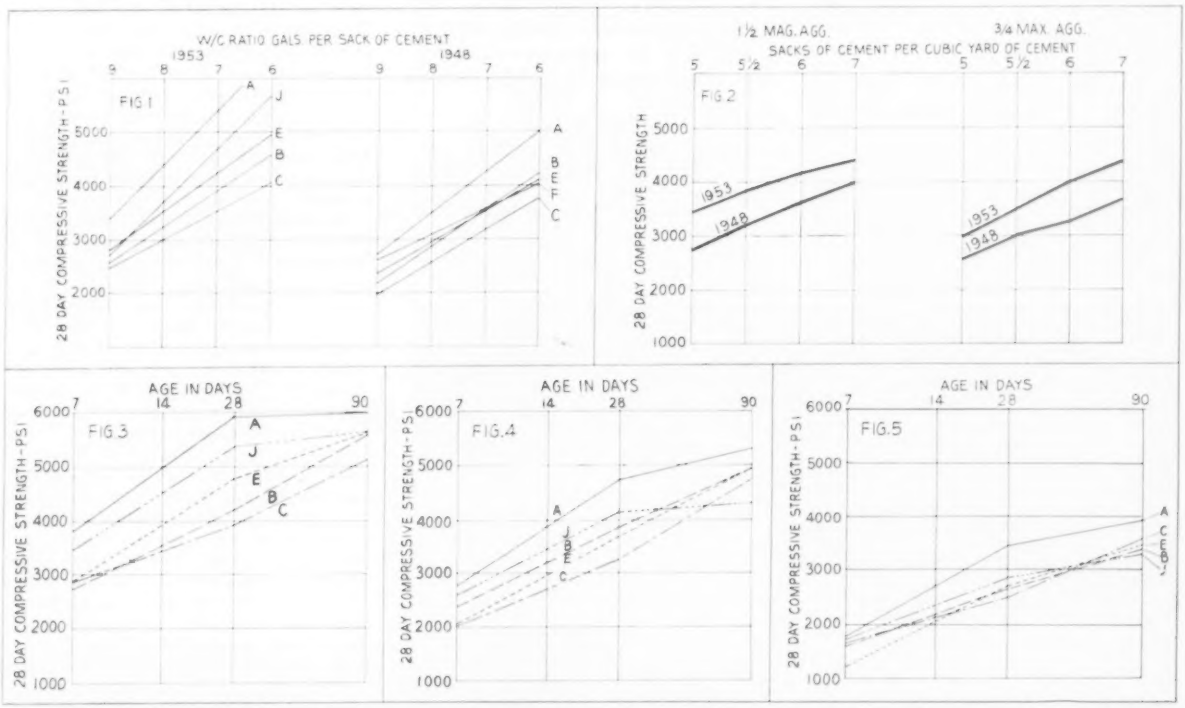


Fig. 1: Relative w/c—strength relationships of concrete, using each of several brands of cement. Fig. 2: Comparative compressive strength of job sampled concrete, each curve representing 100 tests. Fig. 3: Relative strength of concrete, using several brands of cement (w/c=6½ gal./sk.). Fig. 4: Relative strength of concrete, using several brands of cement (w/c=7½ gal./sk.). Fig. 5: Relative strength of concrete, using several brands of cement (w/c=9 gal./sk.)

Overall view of washing and screening plant. In foreground haulage unit is dumping over grizzly to hopper feeding belt conveyor

Problem of FINE SAND Recovery At Folsom Dam

By WALTER B. LENHART

Aggregates processing plant at Folsom Dam uses rod mills, sand sizers, and liquid cyclones to obtain desired fines to meet specification

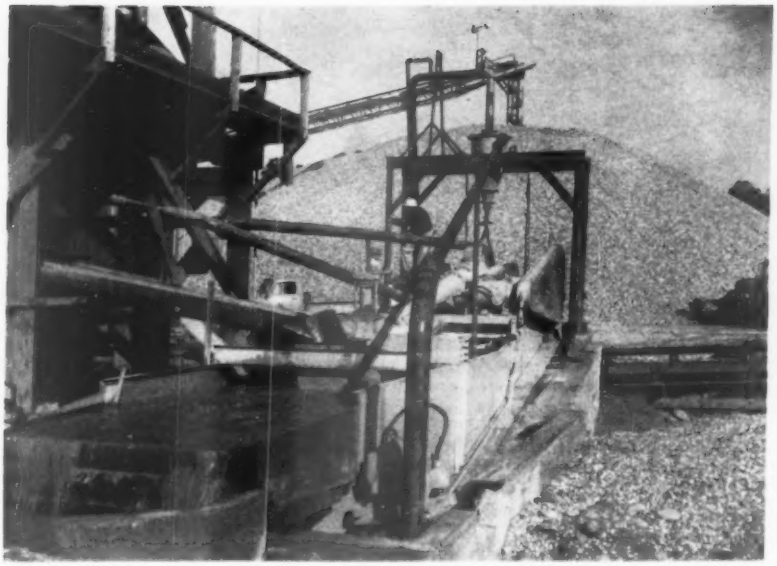
SEVERAL INTERESTING PROBLEMS are involved in the aggregate processing plant for Folsom dam, now under construction on the American river about 20 miles east of Sacramento, Calif. Some of these problems were described in an article in ROCK PRODUCTS, March, 1953 issue. At that time it was indicated that the sand recovery system would probably be overhauled. This need stemmed from a deficiency of minus 100 and a minus 200 mesh in the finished concrete sand. Sand for the dam, a U. S. Army, Corps of Engineers project, is required to comply with their specifications.

As the trend in federal as well as many state highway department construction projects is to specify progressively more and more fine sand in the 100, 200 and minus 200 range, the processes available for recovering sand down as fine as 325 mesh are becoming increasingly important to all producers. One state highway particularly can be used as an illustration of a trend that could become more general. This is the adoption by the California Highway Department of the so-called "Sand Equivalent Test." This test was described for the first time in any national publication in ROCK PRODUCTS, January, 1953, page 93. The test is an addendum to screen analysis, and is a quick field method of determining the relative volumes of fine sand, silt, clay, etc. as well as the volumes of coarser sand in the sample. The adoption of the test literally means that *all* sand must be washed.

Discharge line in foreground carries the slimes from the 24-in. liquid cyclone. This gives some idea of the large volume these units handle

A second facet to the general discussion relates to organics in sand. Where sands are recovered from river deposits, particularly where any excavated pool may be re-filled by Spring freshets, light material upstream can be washed down into the quieter pool area and there be redeposited. Eddies in such a stream often build up a considerable amount of floating organic material.

It is not too difficult to float out coarser fragments of such organics in sand but when sand is processed in the minus 40 to 100 mesh range, the problem can be serious. Fine sands seem to have an affinity for small organic fragments which stem from sand particles and the organics forming "flocs" possibly due to both carrying similar electrical charges. Dispersion of these flocs can be accomplished by the addition of so-called "dispersion agents," or by magnetic de-flocculating magnets. With reference to de-flocculating magnets, the reader is referred to ROCK PRODUCTS, February,



Left: Final sand recovery section. An 8-ft. de-watering unit with liquid cyclone mounted at one end to recover more fines

Right: Close-up liquid cyclone over rake de-watering unit

1953, page 91, where a description of their use is outlined in connection with the heavy media separation process used for separating granite from dolomite at the Kaiser Aluminum and Chemical Corporation, Natividad, Calif.

Use Liquid Cyclones

Operators of the Folsom dam aggregate plant are developing some interesting data on the use of Whirlcones for recovering added fines. The data published here is designed to bring the reader up-to-date, or is a progress report on the method of using this equipment. Work is still in the experimental stages.

Sand processing at Folsom involves two general practices: vibrating screens plus two large rotary scrubber-screens prepare a sand fraction that is recombined with other minus ¾-in. material and sent to a surge pile. Re-screening, rod milling, Dorrco sand sizers and a Dorrco 8-ft. rake dewatering unit reprocess the material in this surge pile, recovering sand and a ¼-in. to ¾-in. aggregate size. At the rotary screen set-up in the preliminary section of the plant, a 60-in. Wemco sand preparation machine has been added to the two sand spirals formerly used and all receive a split flow from the sand screens ahead of the units. As a large volume of water was used on these screens, resulting turbulence was proportionally large and some fine sand lost. The addition of the second sand preparation unit cut this loss quite considerably but a 24-in. Whirlcone was also installed as a fine sand scavanger unit. A considerable portion of the overflow from the spirals is picked up by a 5-in. Wilfley sand pump, and the pulp is sent to the Whirlcone.

The Whirlcone is a liquid cyclone in which the pulp is pumped tangentially into the unit, the centrifugal force within the unit causing the sand fractions to move to the outer perimeter where they work downwards and are ejected as a sand in the 70 to 75 percent solids range. Slimes collect in the vortex of the swirling mass and are removed through the top of the device.

At Folsom dam the Whirlcone at the preliminary plant is mounted above the Telsmith spirals and the recovered fine sand from the cone falls into the spirals about 2 ft. from their normal discharge points. This permits some mixing of the fine sand with current production. A small molasses valve is used to control the discharge as well as an air vent with a suitable valve that can be used to lower the vacuum in the Whirlcone.

Sand Recovery Methods

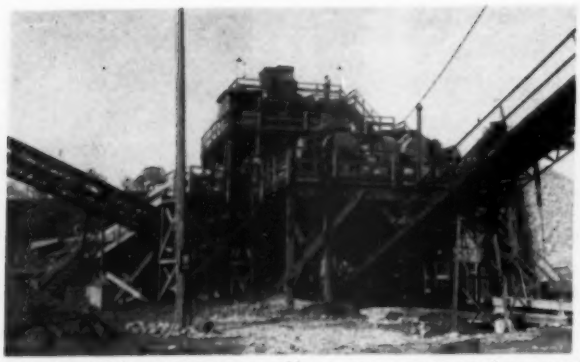
At the final sand processing plant, sand from the Dorrco sand sizers and some of that from the Marcy rod mill are de-watered in an 8-ft. rake-type Dorrco de-watering unit and the finished sand sent to drainage piles for a minimum of 72 hr. drainage. Similar to the preliminary set-up, a considerable volume of water is involved so that overflows carried away some fine sand. Screen tests showed here that 2.8 cu. yd. per hr. of 200 mesh and finer was being lost in the overflows. To correct this situation, a sump about 5 ft. long was built onto the overflow end of the rake dewatering unit. This sump is the same width as the rake unit; i.e., 8 ft. wide. It is hopper-shaped and converges at the bottom to a sleeve in such a manner that a rubber tubing of relatively large diameter connects the sump with a 5-in. Wilfley sand pump powered with a U. S. motor. This overflow contains normally about 2¼ percent solids. A Massco-Grigsby pinch-type valve is between the sump and the pump to control volumes. This unit delivers 800 g.p.m. to a 24-in. Whirlcone mounted about 2 ft. from the head end of the rake de-watering unit. The rake dewatering unit now has practically no overflow and what little that does overflow is mostly discolored water. The pulp going to the Whirlcone has the following typical analysis:

Mesh	Percent
Plus 50	trace
100	4.3
200	53.6
Minus 200	42.1
	100.00

Sand from the Whirlcone discharges out the bottom of the cone through an inverted "Y." This splits the discharge into two fractions of about equal weight. Thus each of the two rakes gets about the same amount of fines so that mixing with current production is improved. A pinch type valve on the rubber sleeves of this "Y" helps control discharge products.

Specifications for Folsom dam require 5 to 9 percent minus 100, plus 200 and 3 to 6 percent minus 200 mesh. Plant operations are set up to produce 6 percent for the former and 4 percent of the latter. Before the cone was installed the minus 100, plus 200 mesh was in the 3 percent range and the pan (minus 200) was in the 2 percent range. The cones brought the minus 100, plus 200 up to the required 5 percent but the minus 200 remained at 2 percent. To meet the minimum specification, the minus 200 mesh will have to come up one point, or to 3 percent. It appears that this can be done as indicated from test data that are discussed later in this report.

Some observations on the operation



Left: Material from two rotary scrubber screens goes to sand screws with the fines (minus 10, plus 200 mesh) recovered from overflows by a 24-in. liquid cyclone. Right: Above may be seen liquid cyclone alongside rotary screen, and below is a 60-in. sand preparation machine at preliminary sand recovery set-up

of a free discharge, liquid cyclone are in order: At a constant pressure and with a constant volume going to the unit, plus a constant diameter of both outlets, the tonnage of material (sand) discharged from a unit should be constant assuming a fairly uniform solids content. In other words, if a unit is producing 2 t.p.h. of sand under a given set of conditions, this 2 t.p.h. discharge rate should vary only within narrow limits. Secondly, if the feed contains a slight excess of coarse and fine fractions, under a given set of conditions, the coarser fraction should be more sensitive to centrifugal force and therefore, in the liquid cyclone, would be more easily recovered. Increasing the pressure within the unit should also increase the centrifugal force (G's) and, at the same time, may or may not increase the amount of material discharged as sand. So if the feed contains sufficient 100 mesh and 200 mesh material to slightly overload a liquid cyclone, a preponderance of 100 mesh material is apt to be ejected first.

Rod Mill Observations

As rod mills are often used to secure more fines in sand, some observations on rod mill and/or ball mill operation may also be in order:

There are two empirical "laws" that over the years seems to hold good when fine grinding is desired. The first is, "The smallest grinding unit (rod or ball) in the mill should be able to crush the largest rock or grain." The second is, "The amount of grinding is directly related to the number of impacts."

Obviously, then if a 10 to 50 mesh sand is fed to a mill, a grinding media of relatively small size should be able to fragmentize the grain. In many wet grinding operations a 1½-in. dia. steel ball would be deemed large enough to crush or grind this size of feed material. So with a vastly greater number of small grinding units in a mill there will be a vastly greater amount of impacts.

So if steel balls are undesirable, then smaller diameter rods so as to fully load the mill will give more impacts and these impacts are far in excess of requirements when reference to their ability to fragmentize a 10 to 50 mesh grain is considered.

But impacts are not the only grinding action in a rod or ball mill. The top surface of the mass of grinding units cascade violently, but those rods or balls below the surface tend to roll upward with the mill as it revolves and, at the crest of movement, this mass rolls back downward. This rolling of media against media accounts for much of the finer grinding if the media are coated with a thick coat of material. Therefore, a pan-cake batter-type of pulp should give more fines.

However, the thicker the pulp, the slower the movement of sand through the mill—this slow movement may result in overgrinding.

Observers have noted that the flow of pulp through a rod mill is a spiral action and thick or thin pulps change the pattern of the design. To lengthen out the spirals to speed up flows through a rod mill, a plastic clay has been added to the feed. This tended to lubricate the material and to cause it to pass through the mill faster. The peripheral discharge rod mill; i.e., fed at both ends and discharging through ports in the shell is designed to speed up the flow of pulp through a mill and cuts the travel time in half. This short travel time in the mill is usually sufficient to do the grinding adequately.

Rod mills have been used with feeds in the 3-in. dia. range. In such instances, reducing the fineness of the feed to minus ½-in. made only about a 10 percent increase in the tonnage ground so indications are that one cannot expect too great a tonnage increase in grinding with reductions in feed sizes.

Test Results

At Folsom when the Whirlcone was operated at an estimated 18 lb. per sq. in. pressure, the sand recovered had the following screen analysis:

Test No. 1

Mesh	Percent
Plus 30	0.02
Plus 50	0.4
Plus 100	33.0
Plus 200	56.0
Minus 200	10.4
	100.0

This did not give the desired gradation so the feed (volume) to the cone was raised by means of the pinch valve ahead of the Wilfley pump with the following results: (Screen analysis of cone's sand discharge)

Test No. 2

Mesh	Percent
Plus 30	trace
Plus 50	1.6
Plus 100	70.4
Plus 200	26.4
Minus 200	1.6
	100.0

This indicated to the operators that the cone was overloaded from a volumetric standpoint, and possibly overloaded with minus 100 mesh sand (including the 200 mesh), so that only the coarser fraction was able to get out of the constant-diameter sand discharge opening at the lower throat of the cone. This is in line with the previously mentioned generalizations.

The next trial was to put the same volume of pulp into the Whirlcone as in Test No. 1, but to increase the pressure. This gave the following sand discharge:

Mesh	Percent
Plus 50	0.4
Plus 100	24.0
Plus 200	56.4
Minus 200	19.2
	100.0

This possibly increased the tons produced and obviously gave more minus 200 mesh than previous tests, a desired feature at Folsom dam.

In most types of liquid cyclones, it has been noted that a vacuum exists in the area of the slime discharge assembly. The amount of this vacuum is related to the amount of water in the sand discharge. The higher the vacuum, the higher the solids content of the discharged sand. This sand flow can get too dense or too ropy and plug the discharge outlet, and conversely can get so thin as to add too much

water to the end product. In most liquid cyclone operations, it is desired to have a sand discharge product that is so low in water that it can be blended with other current sand production without further dewatering. At Folsom the Whirlcones have been installed with a 1-in. pipe that is connected to the slime discharge pipe. It is about 2½ ft. above, and 3 ft. horizontally from the liquid cyclone. At the lower end (for operator's convenience) is a globe valve. Cracking this valve admits air and in a measure helps to destroy the vacuum, thereby increasing the water content of the recovered sands. This is one control feature of the installation. There is some mica in Folsom sand but so far the unit has not helped remove this type of material. Some organics are involved but not serious enough to require special processing to meet specifications.

Removal of organics may require a long residence time in the unit, or dilute pulps, or both. The differences in sp. gr. between wood fragments and sand is so wide that failure to remove organics can stem from differences that are not closely related to differences in relative weight-sizes.

No pressure gauges are used on the cones. Little operating data is available on the operation of the Whirlcone at the preliminary sand set-up. A sampler has been installed at the high end of the Dorrco de-watering unit so that processed sands can be adequately sampled.

It was indicated that possibly a second Whirlcone at the final sand processing plant would obviate overloading considerations and recover practically all the minus 100, plus 200 and minus 200 mesh sand in the pulp, and if this was done, specifications for the minus 200 mesh would be up-graded sufficiently to comply with U. S. Corps. of Engineers specifications. As a rod mill is ahead of the assembly of sand recovery units in the final processing plant, types of feed to the rod mill, rod sizes, and water content of pulp in rod mill can be adjusted to give a maximum amount of 200 or minus 200 mesh sizes.

Better sand gradation is desirable at Folsom, especially for the mass concrete. With the desired gradations, it is the hope of the Corps of Engineers that cement ratios can be reduced to as low as two bags per cu. yd., thus duplicating practices at Pine Flat Dam.

Folsom dam is being built by Merritt Chapman & Scott and The Savin Construction Co. Chas. Alexander is in charge of the aggregate plant with Aubrey D. Martin, aggregate control engineer for the contractors.

Gravel Plant

A & W GRAVEL CO., Waverly, Ohio, has started operation of a sand and gravel plant along Tygart Creek, south of Fullerton, Ohio. C. N. Hillman is plant manager.

Tests Prove Cements Are Better

(Continued from page 69)

study are used on several jobs, and about ten consecutive tests were averaged to obtain each point on the curve.

Kelly ball penetrations (Table 1) laboratory-concrete indicate a tendency for brands A and B to produce slightly higher consistencies than the other cements, and reports from field men confirm this fact. The greatest differences between brands of cements are reflected in the compressive strengths.

TABLE II.—Aggregates used in Concrete in 1948 and 1953

Percent Passing US Sieve	Sand 1948-1953		¾ x ¼ 1948-1953		1½ x ¾ 1948-1953	
1½					98	100
1			100	100	45	40
¾			98	93	8	10
½			54	60		
⅜			33	35		
¼			9	6		
4	100	100				
8	82	85				
16	66	60				
30	38	32				
50	15	13				
100	3	4				
sp. gr.	2.69-2.70		2.7-2.7		2.7-2.7	

TABLE III.—Cement Required for a Stated Strength in Concrete with a Consistency of 2-in. KB Penetration

28-day Comp. strength	Max. Agg.	lbs. cement cu. yd. conc.	Add lbs. cem. plus or minus 1-in. slump
2000	¾	400	10
	1½	360	
2500	¾	440	11
	1½	400	
3000	¾	480	12
	1½	440	
3500	¾	560	14
	1½	510	
4000	¾	640	16
	1½	580	

There are some significant changes between the water-cement ratio curves of 1948 and 1953 shown in Fig. 1. A concrete design, using 7 gal. to a sack of cement, would yield strengths of 3500 p.s.i. to 5400 p.s.i. at 28 days, depending on the brand cement used today. In 1948 the same mix would have made concrete of 3200 p.s.i. to 4300 p.s.i. compressive strength. Brand C and brand B have shown little change (300 p.s.i. increase). Brand A and brand E have increased strength yield about 900 p.s.i. An interesting comparison is made with brands F and J. These cements are made at the same plant. We used brand F in 1948 but now use brand J. We enjoy 1000 p.s.i. more compressive strength in 1953 than brand F gave us in 1948. For the specifications, the 28-day compressive strength is the important age. These wide differences at 28 days are overcome at 90 days. Figs. 3, 4 and 5 illustrate the rate of strength gain. Cements that make high 28-day strengths have smaller gains after that age.

Laboratory-concrete pointed out the detailed changes in brands of cement. Job-made concrete, not identified as to brands of cement, confirmed the improvement in compressive strengths since our water-cement tables were last organized. Fig. 2 includes concrete made with all five brands of cement. These curves are representative of all the concrete produced during the years compared to date.

Our six sack mix in 1953 gave 600 p.s.i. more compressive strength than in 1948. Sampling and testing, production and aggregates have not made the whole difference. We believe cements are better; yet, we wonder a little about tomorrow.

Chemical Limestone

(Continued from page 68)

and other fine products. Also, there are two Tyler Hum-mer screens used in the production of grits and other special sizes. A compartmental bin below permits loading to trucks or cars, either out the sides or the bottom, for shipment or for stockpiling.

Company engineers designed the new primary screening plant and some of the special mining equipment was built at Baton Rouge. Clyde A. Kitto is manager of the Baton Rouge plant. Sam. J. Lolan, Jr., is superintendent of the Prairie du Rocher operation and, incidentally, president of the Village Board. A. M. Telford is assistant superintendent.

This plant has an excellent safety record as a result of the great stress on accident prevention, and since January, 1952, has operated well over 500,000 man-hours without a lost-time accident.

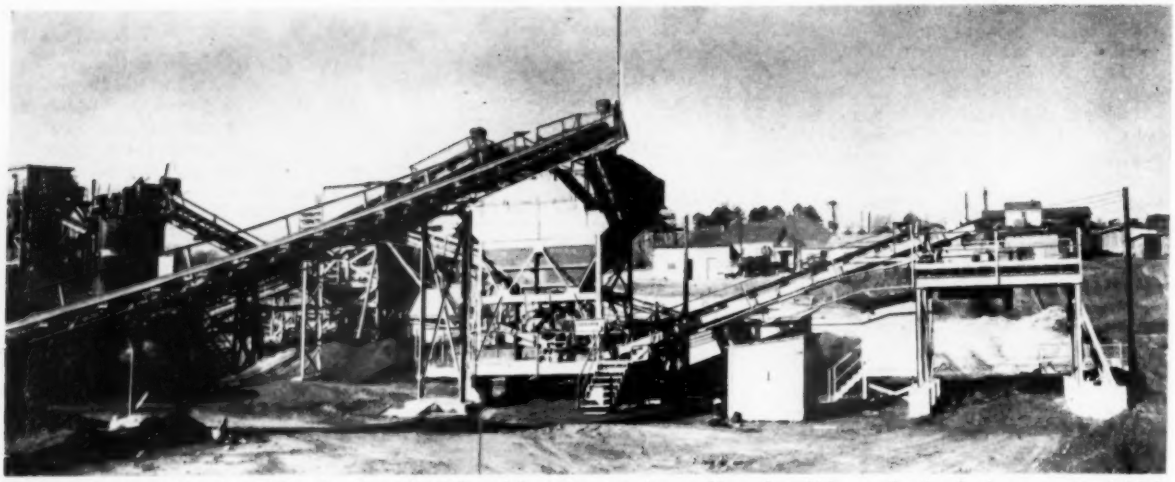
End Uses

The kiln stone produced at Prairie du Rocher is a basic raw material for many products of chemistry which illustrate the economic importance of limestone. It and salt comprise the main raw materials for the manufacture of soda ash by the ammonia-soda process at Baton Rouge, which is a basic alkali for the manufacture of many products.

Limestone is burned in mixed feed (coke) vertical kilns, and both the lime and CO_2 gas are required in the manufacture of soda ash, otherwise known as pure sodium carbonate (Na_2CO_3). Among various products, soda ash is used in the production of glass, aluminum and other metals, chemicals, pulp and paper, textiles, soap and soap powders, cleaners and detergents, petroleum, adhesives, ceramic ware, fertilizers, lumber and wood products, plastics, paints and varnishes, drugs and pharmaceuticals, water-softening compounds, etc. Caustic soda, the strongest alkali, is used in the production of rayon, soap, plastics, explosives, the processing of cotton, oil refining, rubber reclamation, and the manufacture of dyestuffs.

Opens Quarry

RIDDLE QUARRY CO., Marion, Kan., is opening a stone quarry and crushing plant at Gatesville, Kan.



View at Kings Mountain plant of Superior Stone Co. Belt at left carries screenings to bin under which are vibrating feeders preparing S.A.B.C. material. Trucks load to the right. Shed at right, near loading point, is the control station

Producing PLANT MIXED Materials for Stabilized Base Course

By WALTER B. LENHART

Crushed stone producers supplying heavy tonnages of stabilized base course materials for North Carolina State Highway Department

IN NORTH CAROLINA the initials S.A.B.C. refer to a relatively new type of a stabilized aggregate base course material currently being used by the North Carolina State Highway Department under the sponsorship of Charles E. Proudley, chief materials engineer.

A considerable amount of technical thought has been devoted over the years to the advisability of better and more stable road base structures. One solution to this problem evolved by the crushed stone industry and the state highway engineers is reviewed herein.

As prepared in North Carolina, the stabilized aggregate base course is a crushed stone material to which is blended fines either in the form of a sandy-clay topsoil, or screenings from the producing plant or both. Calcium chloride is also sometimes added to the mix.

The essence of the processing is to blend a graded minus 1½-in. crushed stone with a selected soil (or screenings) and to add calcium chloride as required. Electric vibrating feeders are mainly used to blend these three ingredients to a short belt conveyor serving an asphalt-type, pug mill that runs at relatively high speeds. As the drier material is fed to the pug mill, water is usually sprayed into the mix in sufficient quantities to give practically a saturated aggregate; i.e., sufficient so no water will drain out of the mix during subsequent handling and hauling. It has the appearance of a medium to low slump concrete. The mixers observed in this account were of the two-shaft type with paddles at right angles to the shafts. Feed was introduced at one end of the mixer and discharged through a wide-open gate at the opposite end and in the bottom. The speed of the mixer arms was sufficient to "throw" the mixture considerably and to possibly aerate it at the same time. The feed to the pug mill is on a continuous basis, however, in at least one installation the feed belt and pug mill had to be stopped between each truck load. In others a small bin was superimposed under the mixer, and the bin was of sufficient size to hold the material produced between each truck loading. Once the material is produced no stockpiling is permitted. It is hauled to the job in conventional rear dump trucks and put on the road at once. The distance hauled is not of technical importance and is governed only by the economics involved. The base course material does not appear to segregate in transit.

The initials C.A.B.C. represent a similar type of road base, the main difference being that no water is added to the mix, nor any calcium chloride, and it can be stockpiled.

Long conveyor belt B at Baker's plant. To the left is a vibrating screen in rinse tower, and beyond is No. 4 ballast stockpile with reclaiming tunnel for minus 2 in. plus ⅜ in.

Specifications on one job for S.A.B.C. required about 15 percent of selected granular topsoil sprayed with water to the extent of 5 percent of the dry-weight of the aggregate. On this job the material was placed in four 5-in. layers and compacted to 14 in. Each layer was rolled three times per loose inch of material. The compacting rollers had 325 lb. per inch of tread width, the rubber rollers were used first followed later by ring rollers. The latter are usually made by the contractors. They are essentially railroad wheels with flanges removed and grouped on a shaft. In one type, wheels are welded to the shaft and greased journal boxes at the ends allow for rolling movements, and in the second type the wheels turn loose on the shaft with the latter permanently fastened to the supporting assembly. This type is hard to maintain because of lubrication problems. Calcium chloride was only added to the mix making up the top layer so as to prevent dusting and raveling until the surface could be primed for surface treatment. A third and newer type of compaction unit was being used at another North Carolina road job, and it is referred to as a "Vibro-Tamper," made by the International Vibrating Equipment Co. The vibro-tamper is mounted on crawler treads. In front are six heavy steel pads. Each pad is a vibrated unit with power derived from an internal combustion engine mounted on the chassis. Power from the motor is imparted to the vibrator through a shaft that serves all six pads. V-belts connect the engine and the shaft. Each pad is hinged to the chassis assembly at the rear and each has a separate vibrating unit. The pads do not vibrate in any particular sequence and in action they have a "patting" or pounding action. The one observed was being driven in a normal manner with the treads following the compaction. The units appeared to do an excellent job of compaction, and it was said that possibly by their use the stabilized aggregate base course could be laid in one layer. After compaction with the vibro-tamper, other compaction methods may be used to compact the few inches of top layer that might have been loosened by the crawler treads.

The compacted road base appears to be excellently bonded and is practically impervious to water. One described the material as, ". . . you can't even drive a nail in it." At one of the plants visited the access roads around the operation were surfaced some time ago, using the material and during wet or dry weather the roadbed was adequate for intra-plant heavy truck haulage. This operator said in describing the material, ". . . if you took a pick and tried to dig up that material it would come out in chunks a yard square . . ."

Specifications for the material are as follows:

One hundred percent of the density determined by laboratory tests is required. For one material, the density was 142 lb. per cu. ft. Two and one half percent moisture is considered normal after placing. A sample taken from two layers of compacted base on one job weighed 149 lb. per cu. ft. or 105 percent compaction. The moisture was 2½ percent.

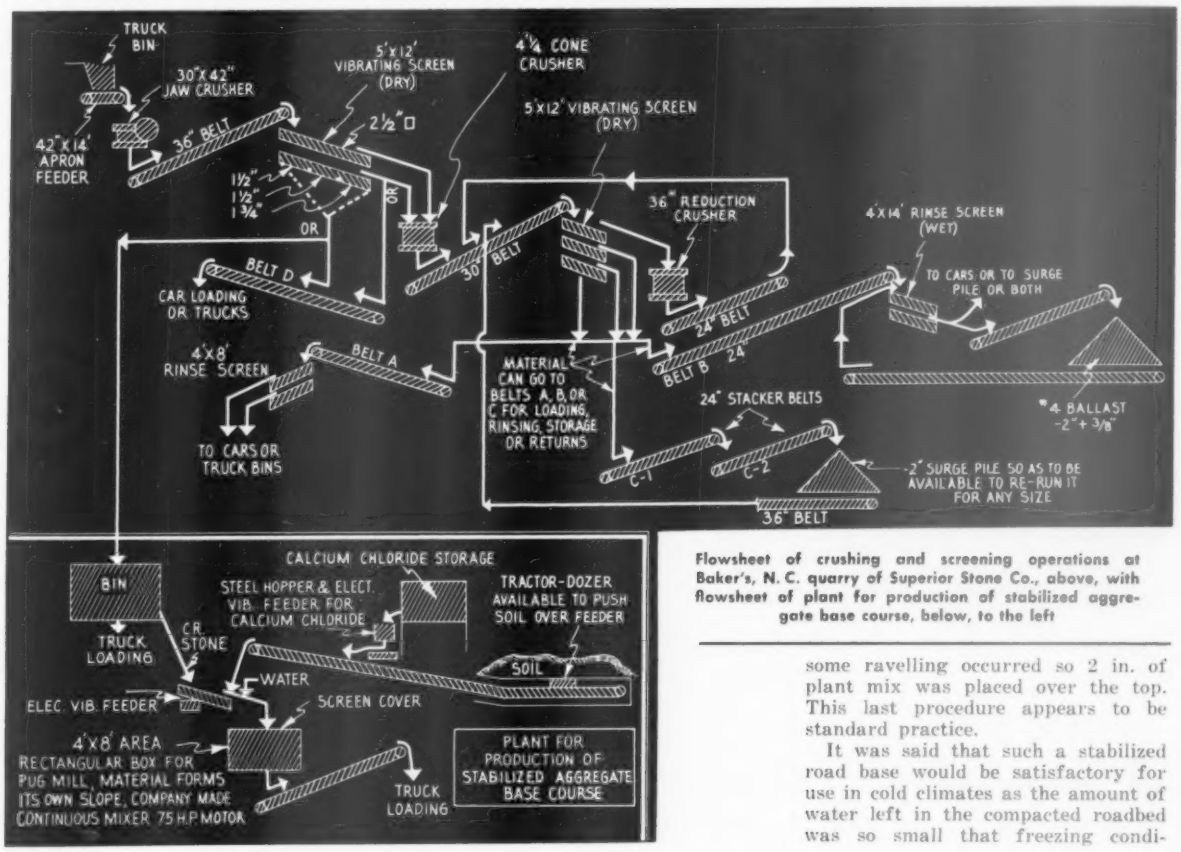
Material Specifications

Gradation specifications require that all material passing the No. 10 shall have not more than 70 percent passing the No. 40, nor over 35 percent passing the No. 200. The average gradation of the stabilized aggregate, including the added soil was:

Passing	Specifications	Job Average
2 in.	100	100
1 in.	75-90	91
½ in.	60-75	69
No. 4	45-60	50
No. 40	15-30	20
No. 200	5-10	9
Liq. Lim.	25	15
Plas. Index	—6	NP

The advantages of the use of S.A.B.C. over blading or mixing on the road bed itself are: segregation is practically negligible and the contractor, it was said, can lay almost twice the yardage with 2000 tons per day of compacting being normal and with an official high of 3100 tons reported in one day, and, with another report of 4000 to 5000 tons per day being produced. In one instance the road base, covered with only ¾ in. of asphalt top dressing, was used by fairly heavy traffic for nine months, however, some ravelling occurred so 2 in. of plant mix was placed over the top. This last procedure appears to be standard practice.

It was said that such a stabilized road base would be satisfactory for use in cold climates as the amount of water left in the compacted roadbed was so small that freezing condi-



Flowsheet of crushing and screening operations at Baker's, N. C. quarry of Superior Stone Co., above, with flowsheet of plant for production of stabilized aggregate base course, below, to the left

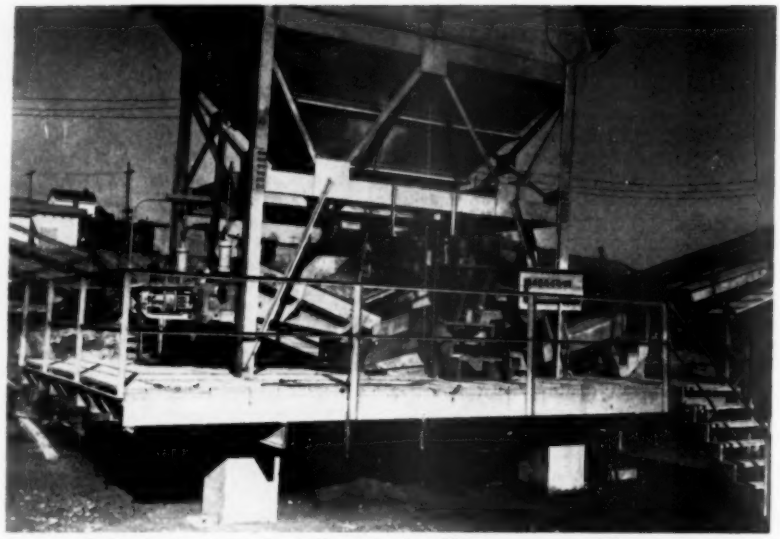
tions would not be a factor, and it was further pointed out that when the material was compacted in accordance with established practices (A. A. S. H. O., Method T-99) gave about 84 percent solids and therefore 16 percent voids which should be adequate for movements due to freezing of the 2 to 2½ percent water in the base course.

Advocates Use of Crusher-Run

One crushed stone operator objected to the excessive use of topsoil. He maintained that greater road stability could be secured by using more stable materials. He advocated the use of crusher-run material to which might be blended dry or wet screenings from the processing plant that prepared the crusher-run. As a last resort, so to speak, the addition of a small amount of topsoil would be permitted under his plan of operation. He further pointed out that if the contractor made the mix on the basis of a 15 percent topsoil inclusion that unless care was exercised in blending, and inspections kept rigid that this 15 percent limit might become too elastic and stability factors be upset resulting in the coarser aggregates "crawling" or moving in the base course. It also was pointed out that hauling the topsoil 5 to 25 miles as had been done is not economic, when possibilities of using plant fines, with minor inclusions of top soil from their strippings might be more than adequate.

At some of the plants preparing the stabilized road base, the practices recommended above were being carried out. These are discussed later in this review.

At still another operation, a crushed granite operation, the producer was preparing the C.A.B.C. material by adding ahead of the primary crusher a natural mixture of decomposed granite plus topsoil. After passing through the crusher, the material was removed as throughs from the lower deck of the scalping screen as crusher-run. The blending technique was on the same basis that a household cook uses — a scoop-full of fines to a truck-load of coarser rock. This material had no water added to it, nor calcium chloride, and was being stockpiled.



Close-up of vibrating feeders at King's Mountain plant blending coarse and fine aggregates and calcium chloride to belt conveyor at right. Second push-button control station is shown. Small steel hopper is for calcium chloride

Superior Stone Co. Practices

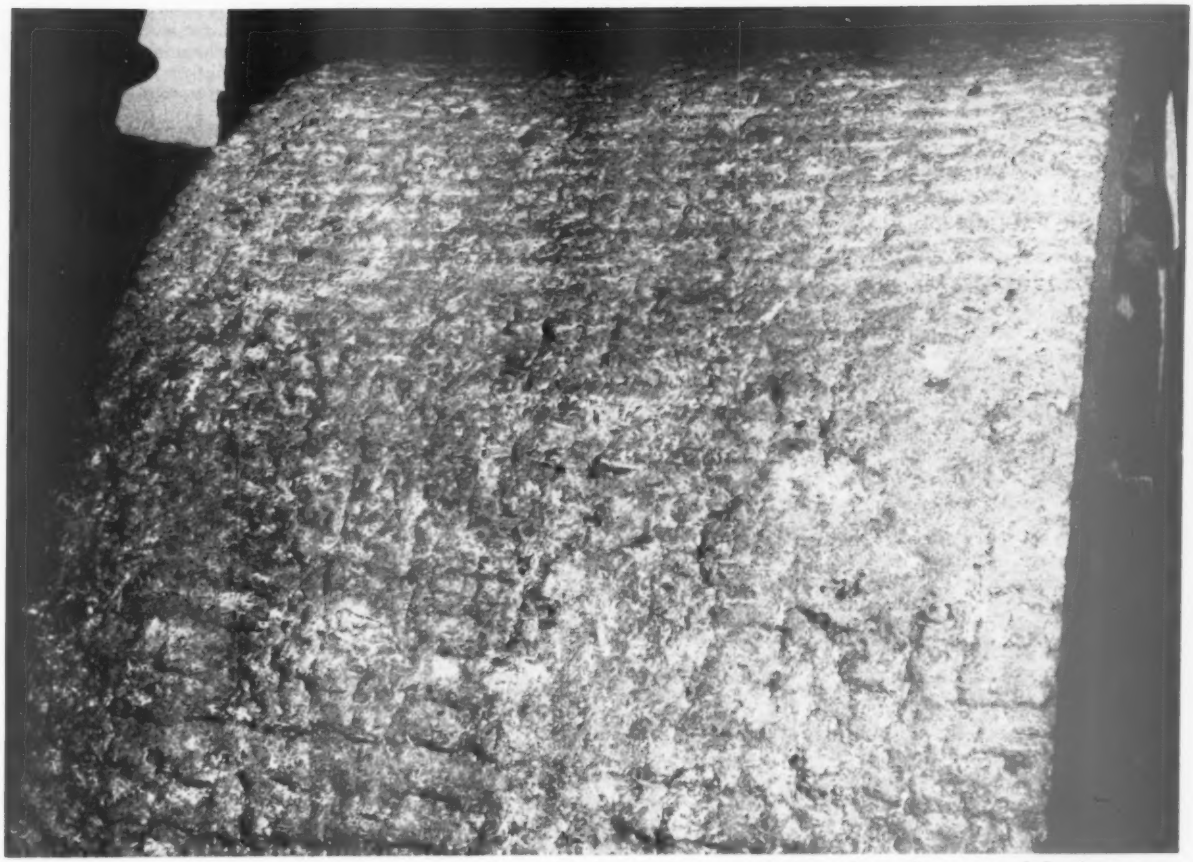
In collecting the data incorporated here, the Superior Stone Co. quarries, Midlands, Bakers, King's Mountain, and the Bluestone, were visited as well as several others. This company pioneered the processing techniques currently used by most producers. At two other quarries in the same general area, the contractor building the road had installed his own equipment to provide the mix. In one of these cases a 5-cu. yd. mixer was used. At this operation, washed and settled screenings were used along with the crusher-run material. In the other a portable mixer rig had been assembled. Neither were in operation at the time of inspection.

The Midlands technique has been described in North Carolina construction publications serving the general area, and also was the basis for a paper describing the whole processing system at the 1953 National Crushed Stone Association convention, given by Chas. E. Proudley. However, at the time of inspection most of the Midland plant was being moved to a new location near Kannapolis, N. C., so a more detailed description of the Bakers operation will be used as an example of processing techniques. Brief mentions of the King's Mountain and Bluestone systems are included.

Quarry and Plant Operations

The Bakers quarry of Superior Stone Co. is located near Monroe, N. C., and southeast of Charlotte in the mid-western part of the state. The rock processed, described as a trap-

Left: Calcium chloride shed and feed in center foreground; belt conveyor D in background, at Baker's plant, Superior Stone Co. Right: Pile at left is the top soil. Blending and screening plant is shown in the background



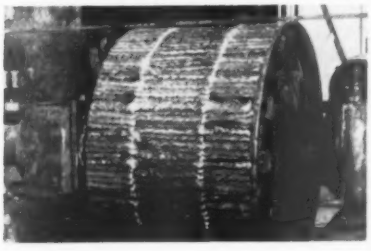
These rolls, hard-faced when new with Coated Tube Stoodite, have been in operation 3 months, crushing extremely hard river rock. When hard-facing is re-applied beads are slightly separated, areas between being filled on successive applications.

IMPROVING CRUSHER EFFICIENCY with Stoody Hard-Facing

All crusher rolls lose sizing efficiency because of uneven wear. As roll centers become worn, a gap develops between them, permitting oversize material to pass through. With continued wear, crusher adjustments cannot compensate and efficiency is lost.

BALANCING WEAR RESISTANCE

The answer is use of two Stoody Hard-Facing Alloys of dissimilar wear resistance. Roll centers are protected with Coated Tube Stoodite; outside areas with Stoody 21. *This procedure concentrates extra wear resistance where most needed, at the same time saves money by using a lower cost alloy on edges!* Net result is balanced wear, flatter roll surfaces and more uniform sizing of material over life of the rolls.



HARD-FACING KINKS

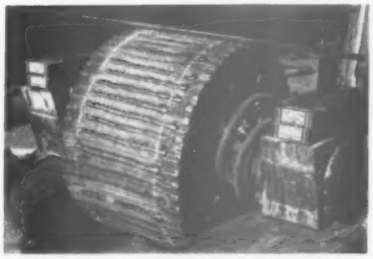
Always skip-weld to avoid overheating. New hard-facing beads can be applied alternately between former deposits.

After repeated welding, manganese rolls may deteriorate from application of heat, causing hard metal to spall. This can be prevented by applying a layer of Stoody Nickel or Moly-Manganese to the parent metal after 3 or 4 hard-facing applications. If crusher rolls are carbon steel, use Stoody Build-Up.

IMPROVING GRIP

A better grip is possible if one roll is hard-faced with a series of spaced stringers, forming corrugations. Follow the same bi-metal technique for balancing wear.

By repeating hard-metal applications, as required, three times normal life is not unusual for crusher rolls. This and other crusher hard-facing techniques are described in the Stoody Hard-Facing Guidebook.



This illustration shows method of spacing stringer beads on one roll to improve grip. Coated Tube Stoodite is applied in center area, Stoody 21 on outer edges.

Ask your Stoody dealer for a copy (See the yellow pages of your phone book) or write direct!

STOODY COMPANY

stone, is a pit operation. A considerable volume of dirt strippings are involved with two well defined rocks exposed in the pit. Loading in the pit is by a 2½-cu. yd. 80-D Northwest and a 1½-cu. yd. No. 6 Northwest shovel. Five 15-ton capacity rear dump Euclid trucks do the hauling to the first crusher. Primary drilling is with wagon drills augmented by a Joy blast hole drill.

The flow diagram gives the essentials of the plant layout which is built around the use of a 30- x 42-in. Pioneer primary jaw crusher, a 4¼-ft. standard Symons cone, and a 36-in. Telsmith reduction unit for additional crushing. A 5- x 12-ft. Tyrock double-deck screen and a 5- x 12-ft. Ripl-flo screen take care of the primary screening with a 4- x 8-ft. Nordberg and a 4- x 14-ft. Seco double deck screen for final screening and/or rinsing purposes. The plant has a nominal capacity of 250 t.p.h. and has been at this site for about five years. It is on the rails of the Seaboard railroad with a considerable tonnage moved out by trucks that are weighed at the plant.

The first screen in the plant set-up is the Tyrock double deck unit which prepares the material for the base course. It has three sections of 2½-in. wire for a top deck, and normally two sections of 1½-in. and one section of 1¾-in. for the lower deck although these may be changed to meet specifications. As the material is screened dry, it is essentially a crusher-run product. The finished size falls to a bin under which is a heavy-duty Jeffrey electrical vibrating feeder that feeds the stone into a company-made, asphalt-type pug mill. It uses a 75-hp. motor. Nearby is a storage pile of selected topsoil of considerable size. It is secured from a site about five miles from the plant, and delivery is made by trucks.

Blending Method

Under the soil stockpile is a reclaiming tunnel with a reclaiming belt conveyor that delivers to the pug mill. As the belt emerges from the reclaiming tunnel, calcium chloride in a steel hopper, holding a few hundred pounds, is fed to the topsoil by a small Jeffrey vibrating feeder. A small storerooom, adjacent to the feeder assembly, is used for storage of the calcium chloride. At the pug mill, water is sprayed onto the incoming mix. The pug mill is covered with a piece of coarse mesh wire screen. The operating platform is alongside the pug mill. Finished material falls to a small surge bin and almost immediately to a short off-bearing inclined belt conveyor that delivers to the trucks. The mixing assembly does not have to shut down between truck loads.

The topsoil at Bakers, when slightly damp, has many of the properties of a foundry moulding sand. When the material is shaped in the closed hand it easily retains that shape without sticking to the fingers. It is light brown or yellowish in color and any sand inclusions are not easily apparent to the touch. The soil used is classified as A-2-4 which is a good lean sandy soil with a plasticity index never higher than 2, and generally non-plastic. The liquid limit is 18 to 22. The material, as delivered to the job, has a plasticity limited to 6 and the liquid limit not to be over 25 percent.

J. W. Powell, superintendent at Baker's plant

At Bakers the storage pile for topsoil, when not in use, is kept covered with a large piece of canvas tarpaulin and at times it is necessary to have men poke the soil down to the feeder augmented by a tractor and dozer for moving material up to the throat of the feeder.

The same mixing and conveying equipment can be used for the preparation of the so-called C.A.B.C. material which is practically the same as the S.A.B.C. except that no water or calcium chloride is added to the pug mill. When big jobs are being processed, the highway department usually has an inspector at the plant.

Production of stabilized aggregate road base material at the King's Mountain operation of the Superior Stone Co. is similar in principle to the Monroe and Midlands operation. However, the King's Mountain installation has certain refinements from an engineering and designing point of view. The plant is laid out for efficient and economical production, and as a separate operation. However, the important difference in this set-up is the difference in types of raw material used. King's Mountain is a blue limestone taken from a quarry that is now about 200 ft. deep and it is mined from two benches. The primary crusher assembly is located near the bottom of the quarry. Instead of a selected soil being used as the additive, this operation uses fines or screenings from the washing plant. These are a minus $\frac{1}{16}$-in. and minus $\frac{1}{32}$-in. materials that flow to a settling pond. The coarser particles settle out quickly with the slimes and extremely fine material settling further out in the pond. Material near the shoreline is bailed out with a clamshell, and after drainage is hauled to the pile over the tunnel and reclaiming belt conveyor that is a part of the stabilized aggregate road base plant.

King's Mountain Operation

The coarse aggregate is designed to meet the specifications previously referred to. In essence, the quarry rock is first crushed in a jaw crusher and moved by belt conveyor to a scalper screen. Plus material goes to a 5½-ft. Symons cone crusher with the fines from the screen and the throughs from the cone joining on a belt conveyor that delivers to a 6- x 12-ft. Tyrock double-deck screen. The throughs from the lower deck, which is minus 1⅝-in., is the so-called crusher run that is the coarse aggregate for the stabilized road base material. This material is moved by belt conveyor up to a two-compartment bin; one compartment used for the coarse limestone and the other for the screenings.

Screenings are piled over a reclaiming tunnel with a Jeffrey electric vibrating feeder delivering to the reclaiming belt conveyor serving the bin.

Under the two-compartment bin are two additional Jeffrey vibrators; one for the coarse aggregate and the other for the screenings. Alongside this assembly is a third smaller Jeffrey vibrating feeder for the calcium chloride. All three materials join on a 36-in. belt conveyor that elevates the material slightly and dumps it into the mixer. The 4- x 8-ft. mixer, driven through a gear reduction unit, uses a 75-hp. motor. There are two shafts in the mixer (pug mill type) with the shafts paralleling the long axis of the unit. Feed is introduced at one end of the mixer and discharges continuously at a wide-open door in the bottom, at the opposite end of the mixer. There is no storage bin following the mixer so that the main units of equipment must stop between each truck load. The mixer discharges direct to the truck below it.

The mixer blades operate at a relatively high speed so that the ingredients are in violent turbulence during their presence in the unit. Adjacent to the truck loading point is a small control room with easily available push button start and stop switches. The operator also has a water control valve in the room with which he adjusts the required amount of water to the mixer. Outside and nearer the three vibrating feeders is a second set of push button switches that are used mainly to stop the various units of equipment. With the exception of the control room, the plant operates without cover. Recently, in the main screening section of the plant, two F-900 W. S. Tyler Co. triple-deck screens were installed. These operate wet, and replace two 5- x 10-ft. units as additional screening capacity was required. Considerable data was published on the King's Mountain operation of the Superior Stone Co. in

ROCK PRODUCTS, January, 1947, page 103. J. H. Arthur is superintendent at King's Mountain. H. C. Mayes is general superintendent for all plants in the general area for the Superior Stone Co.

At the Bluestone quarry of the Superior Stone Co. a hammermill was being used to disintegrate a granitic type of surface material which was being used for the finer portion of the stabilized road base. The machine had very little fine grinding to do and was processing 60 to 70 t.p.h. The hammermill used was a Day, Jr. unit.

On one road job processed from the Midlands plant the contract price was $1.91 per sq. yd. of base and 33¢ per sq. yd. of surface treatment. The project provided a 24-ft. lane highway over 16 miles long that involved a double bituminous surface treatment.

The Superior Stone Co., has plants at Woodleaf, King's Mountain, Bakers, Greensboro, Denver, Belgrade, Midland, Kannapolis and Bluestone, all in North Carolina. At Red Hill in Virginia is a granite quarry and processing plant, and at Gordonsville is a limestone operation. The company also has a plant at Charleston, S. C., and at Augusta, Ga.

W. T. Ragland, Sr., is chairman of the board, and W. T. Ragland, is president of the Superior Stone Co. Other officers are W. M. Ragland, vice-president; L. B. Shuping, secretary-treasurer; John Bratton, general manager; and J. W. Yates, sales manager. J. W. Powell is superintendent of the Bakers operation. A. F. Powell is in charge of the Midlands-Kannapolis plants. L. G. Collins is superintendent of the Bluestone plant. The main offices of the company are in Raleigh, N. C.

Canadian Cement Production

PRODUCTION OF PORTLAND CEMENT in Canada totaled 1,565,000 bbl. in January, 1954, a 5 percent increase over the 1,484,000 bbl. produced in the same month of 1953. Shipments of cement in January, 1954, totaled 889,000 bbl., a 14 percent decrease from the 1,037,000 bbl. shipped during January, 1953. Month-end stocks amounted to 1,606,000 bbl., compared with 1,203,000 bbl. for the previous year.

Cement Ship Back in Service

PERMANENTE CEMENT CO., Oakland, Calif., has placed its 58,000-bbl. bulk-cement vessel, the SS. Permanente Silverbow, back into service. The ship, damaged last winter in a collision at sea, was repaired and overhauled at a cost of over $350,000.

Jordan Cement Plant

JORDAN'S FIRST CEMENT PLANT, located at Amman, the capital city, has been placed in operation. The plant, built at a cost of $2,870,000, has a capacity of 200 tons of cement daily.

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NEW CONTROLS • All control levers, large brake pedals, clutch throwout lever, house lock lever, throttle, etc., have been conveniently grouped with the operator's comfort and additional ease of operation in mind.

NEW HOUSE LOCK CONTROL • New foolproof and positive over-center house lock control. Designed for greater ease of handling and conveniently located for operator.

NEW SET-BACK GANTRY • Bridge type, all-welded construction. Allows better vision, makes crane work easier.

NEW FLOOR FRAMES,
NEW SIDE FRAMES,
NEW COUNTERWEIGHT.

CAPACITY • Model L2: ½ cu. yd., 10 ton crane. Model E2: 4/10 cu. yd., 7½ ton crane.

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SILICA CEMENT

Strength and Heat of Hydration Properties

By T. YOSHII* and K. KANEKO**

SILICA CEMENT (JIS R-5212) herein referred to, is included in the group of so-called portland pozzolanic cements.

In 1865, Michaelis said that by adding some adequate quantity of suitable admixture to portland cement, the quality of yielded cement is much improved.

The relation between heat of hydration and strength of a silica cement classifies it as a moderate heat or a low heat cement.

Procedure of the experiments:

Clinker used—Normal portland cement clinker by dry process

Admixtures—Tuffaceous shale and siliceous materials.

Gypsum—Natural gypsum—about 35 percent SO_3

Clinker grinding mill—A test mill (78 cm. dia. by 45 cm., length-50 r.p.m.) and a production mill (2.2 x 12 meter)

Fineness of cement—Group A—Spec. surface about 3000 cm²/g (Blaine). Group B—Spec. surface about 4000 cm²/g (Blaine)

As the strength of cement (T) yielded by the test mill does not develop like that made by a production mill (F), owing to deficiency of fines, the ratio of F/T was experimentally obtained as follows:

Therefore, strengths of cement made by the test mill and the production mill were adjusted to the same level.

I. Relation between admixture (percent) and heat of hydration

1) Though heat of hydration of silica cement differs with the kind and proportion of admixtures (M percent), it decreases generally with the gain of admixture; viz, (0.4-0.9) M (percent) or 0.7 M (percent) mean.

2) Heat of hydration of silica cement increases with the gain of fineness (Cm²/g), comparing the cements of 3000 cm²/g order to 4000 cm²/g order, there is 5-10 cal/g difference

(Continued on page 82)

Table 1. Factor of cement strength

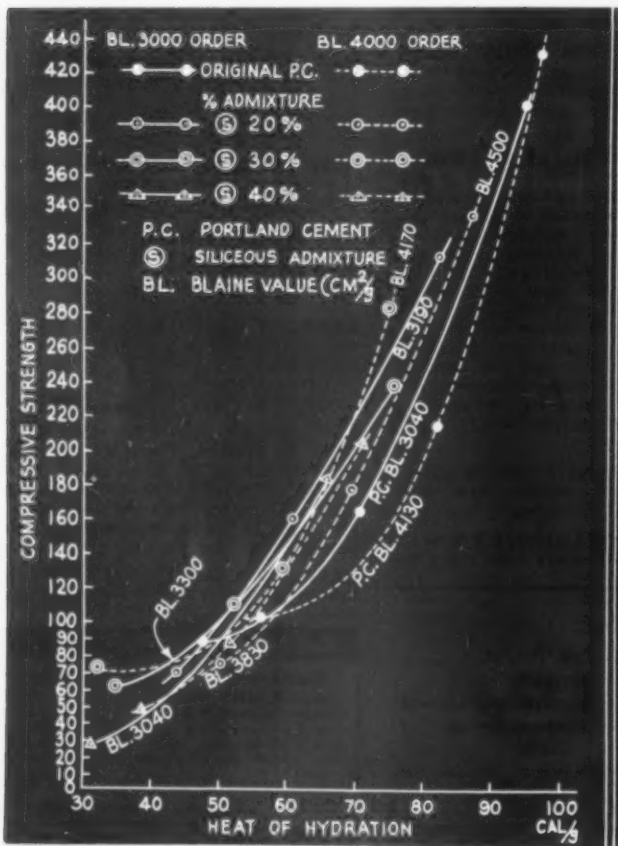
Factor	Age	Flexual St.	Comp. St.
F/T	3 day	125 percent	144
	7 day	122 percent	124
	28 day	110 percent	110
	91 day	107 percent	108

Table 2-A: Proportion of admixture—Heat of hydration—Cm²/g (Blaine); ca. 3000 order

Proportion	clinker (percent)		100		80		70		60
	admixture (percent)		0		20		30		40
Fineness	Res. on 88μ sieve (percent)		1.2		1.6		1.6		1.6
	Cm²/g (Blaine)		3040		3190		3300		3040
Heat of hydration (cal/g)	3 day	47.7	(100)%	44.0	(92)%	35.1	(74)%	31.4	(66)%
	7 day	70.8	(100)	61.0	(86)	52.7	(74)	45.2	(64)
	28 day	94.8	(100)	82.2	(87)	75.8	(80)	66.2	(70)
Decrease of heat of hydr. (percent) per 1 percent admixture	3 day		—		—0.40 percent		—0.87		—0.85
	7 day		—		—0.70		—0.87		—0.90
	28 day		—		—0.65		—0.67		—0.75

*Dr. Eng. Director and Chief Chemist of Chichibu Cement Co. Ltd.

**Chemist of Chichibu Cement Co. Ltd., Saitama, Japan



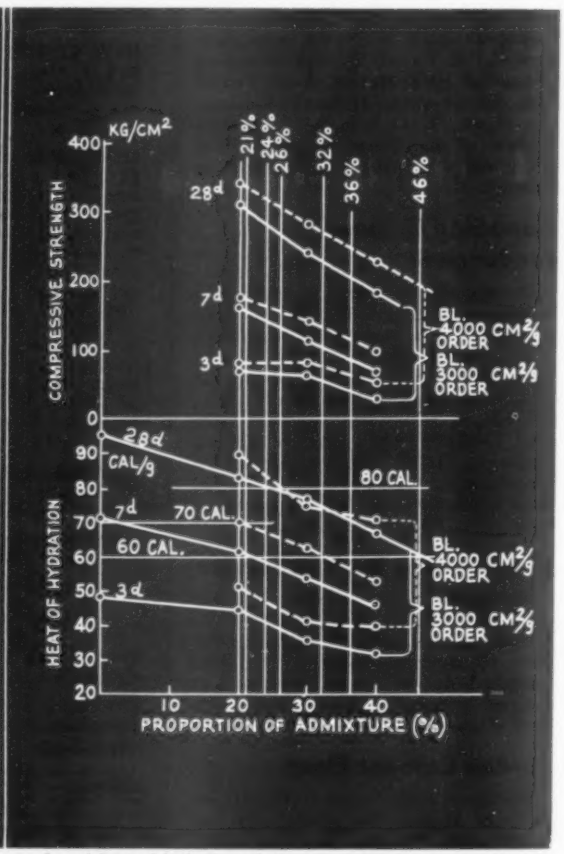


Fig. 1, to the left: Curves showing that with an increase in admixture, both strength and heat of hydration of silica cement decreases, but drop in percentage of heat of hydration is less than the strength. Fig. 2, to the right: Percentage of admixture as it affects strength and heat of hydration

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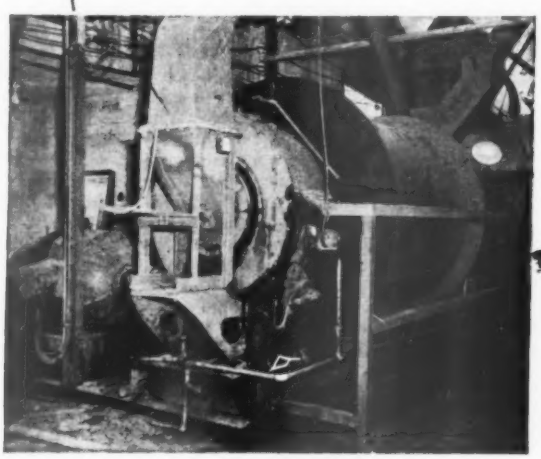
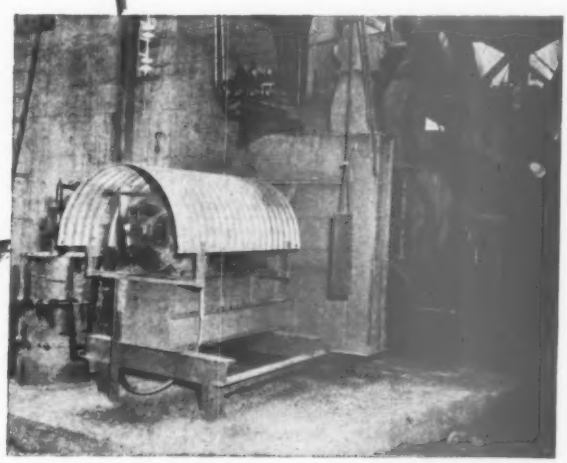


Kennedy-Van Saun ball mill for grinding coal for kiln fuel.



Kennedy-Van Saun exhaust fan in foreground, K.V S. ball mill in background.

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Silica Cement

(Continued from page 80)

between them as shown in Table 2A and 2B.

II. Relation between strength and heat of hydration.

(1) As shown in Table 2-3 and Fig. 1, with the gain of admixture, both strength and heat of hydration of cement decrease, but the drop in percentage of heat of hydration is less than the strength.

(2) When the admixture is over 30 percent, development of strength suddenly falls down.

(3) The finer the silica cement, the greater its strength develops, especially at more than 7 days.

(4) If the admixture were increased, the drop of flexural strength is about 10 percent less than the drop of compressive strength. This fact may be a proof that silica cement is more durable.

Summary

(1) Strength and heat of hydration and limiting quantity (percent) of admixture in silica cement was investigated.

(2) Silica cement is not only durable and water tight, but meets the specification of moderate heat and low heat type cements adequately by adjusting the composition and proportioning of admixtures.

(3) It is not true that concrete made with silica cement is accompanied by shrinkage. It can be easily controlled by selecting a suitable admixture and adjusting its proportioning in the silica cement.

Table 2-B: Proportion of admixture—Heat of hydration—Cm²/g (Blaine); ca 4000 order

Proportion	clinker (percent)	100		80		70		60	
	admixture (percent)	0		20		30		40	
Fineness	Res. on 88μ sieve (percent)	1.2		2.0		2.1		1.2	
	Cm²/g (Blaine)	3950		4500		4170		3830	
Heat of hydration (cal/g)	3 day	56.5	(100)%	50.5	(89.4)%	40.8	(72.2)%	39.0	(69.0)%
	7 day	82.0	(100)	69.8	(85.1)	62.1	(75.7)	52.1	(63.5)
	28 day	96.8	(100)	89.0	(91.9)	74.3	(76.8)	70.8	(73.1)
Decrease of heat of hyd. (percent) per 1 percent admixture	3 day		—		−0.53		−0.93		−0.78
	7 day		—		−0.75		−0.81		−0.91
	28 day		—		−0.39		−0.75		−0.65

Table 3-A: Strength—Heat of hydration—(Cm²/g (Blaine)—3000 order)

Proportion	clinker	100	80	70	60
	admixture	0	20	30	40
Fineness	88μ (percent)	1.2	1.6	1.6	1.6
	Cm²/g (Blaine)	3040	3190	3300	3040
Flexural St. (Kg/cm²)	3 day	23.2	19.3	16.1	6.8
	7 day	43.3	41.4	30.0	21.7
	28 day	77.7	69.7	61.5	42.5
	91 day	86.1	71.6	71.3	54.8
Compressive St. (Kg/cm²)	3 day	86	69	59	27
	7 day	164	159	109	66
	28 day	399	311	238	183
	91 day	460	367	311	256
Heat of hyd. (Cal/g)	3 day	47.7	44.0	35.1	31.4
	7 day	70.8	61.0	52.7	45.2
	28 day	94.7	82.2	75.8	66.3
Comp. St. Heat of hyd.	3 day	1.80	1.57	1.66	0.86
	7 day	2.32	2.61	2.09	1.46
	28 day	4.21	3.78	3.14	2.76

Table 3-B: Strength—Heat of hydration—(Cm²/g (Blaine)—4000 order)

Proportion	clinker	100	80	70	70*	60
	admixture	0	20	30	30	40
Fineness	88μ (percent)	2.8	2.0	3.0	1.2	1.2
	Cm²/g (Blaine)	4130	4500	4170	4200	3830
Flexural St. (Kg/cm²)	3 day	27.2	20.5	16.6	22.5	11.4
	7 day	49.6	41.2	35.1	35.7	30.0
	28 day	71.2	68.6	58.7	57.4	53.0
	91 day	73.6	70.9	67.6	61.7	60.1
Compressive St. (Kg/cm²)	3 day	101	73	71	91	48
	7 day	213	177	130	153	87
	28 day	418	336	282	278	206
	91 day	476	396	345	356	289
Heat of hyd. (Cal/g)	3 day	56.5	50.5	32.2	44.0	39.0
	7 day	82.0	69.8	59.7	63.1	52.1
	28 day	96.7	87.0	75.2	76.7	70.8
Comp. St. Heat of hyd.	3 day	1.79	1.44	2.20	2.07	1.23
	7 day	2.60	2.54	2.18	2.42	1.67
	28 day	4.32	3.86	3.75	3.62	2.91

*A different admixture used

Table 3: Limit of Admixture (percent) in Silica Cement as used to Moderate Heat or Low Heat Cement.

Kind	Fineness Cm²/g (Bl')	Ages	Minimum limit (percent) of admix. based on Heat of Hyd.	Strength to be obtained (max.) kg/cm²	Spec. Comp. Strength ASTM	Spec. Comp. Strength JIS (approx.)
Moderate heat (type II)	4000	7 d.	20	175	1500 p.s.i.	100 kg/cm²
		28	26	305	3000	200
	3000	7 d.	2.5	160+2	1500	100
		28	24.5	280	3000	200
Low heat (type IV)	4000	7 d.	32	130	800	53
		28	46	190	2000	153
	3000	7 d.	21	160	800	53
		28	36	205	2000	133

Book Review

By DR. F. O. ANDEREGG

CEMENT CHEMISTRY, Dr. Hans Kuehl; published by Verla Technik, GmbH Berlin NW 7.

Hans Kuehl is the dean of German cement chemists, having been in the cement field for half a century. He has personally trained the majority of German cement chemists and has published more than 100 technical papers on numerous phases of cement chemistry. He has been affiliated with the Berlin Technical High School, and has been continuously active in consulting work. The tremendous bombing of German cities has placed a great burden on the building materials industry, and the dislocation of trained personnel has created a tremendous demand for competent technical help. To help fill this need, the professor has devoted many years to a thorough treatise on the chemistry of cement, published in three volumes.

In the first volume, the fundamentals of physical chemistry required in cement technology have been stated in his easily readable style. The states of matter are covered; disperse systems are discussed, as well as equilibrium in homogeneous and heterogeneous systems. The thermo-chemistry needed is properly disclosed and sufficient optics, X-ray, electronmicroscope and techniques are described. Nearly 300 pages are devoted to this part.

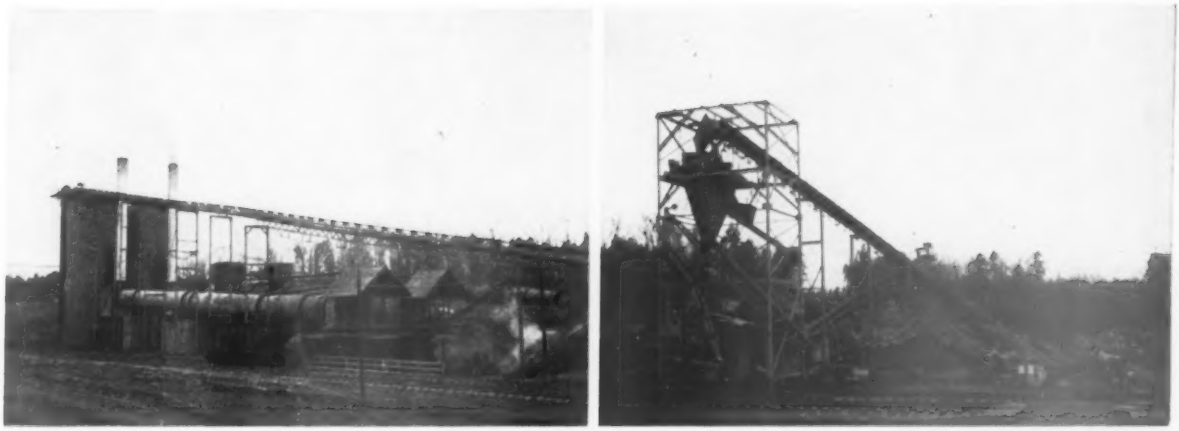
In the second volume, various hydraulic cements are treated, including raw materials and composition, and also pozzolans. Those cementing materials prepared by burning without sintering are thoroughly discussed. A great deal of careful attention is given to portland cement clinker in all its phases, and a number of special cements are described. This volume comprises about 650 pages. The first two volumes have been purchased in quantity, and are now in their third printing.

The third volume has just been published and uses about 500 pages for a discussion of hydration products, the hardening process, and the cement applications. Dr. Kuehl has been very active in contributing to the great development of cement technology during the first half of the twentieth century, and these three volumes should be required reading for all cement technologists.

The volumes contain several hundred references, among which may be found references to the cement literature in our country.

Change of Ownership

THE BRAMHALL CO., quarry at Gillian, Mo., has been taken over by Duderstadt Construction Co., Carrollton, Mo. Agricultural limestone, road stone, rip rap and plant-mix asphalt are produced at the quarry. Plant capacity is over 1000 tons daily. Harry Wallace is quarry superintendent.



Overall views of plant, showing kilns, coolers, finished raw material storage silos, to the left, with long conveyor from crushing and screening section, to the right

Automatically Controlled KILNS and FUEL SYSTEM For Lightweight Aggregate Plant

Carolina Solite Corp., near Aquadale, N. C., manufactures lightweight aggregate from hard slate. Electronic control for pulverized coal preparation system to supply kilns

By WALTER B. LENHART

ONE OF THE NEWEST manufactured lightweight aggregate plants is the Carolina Solite Corp. operation near Aquadale, N.C., some 40 miles east of Charlotte. This company, a subsidiary of the Southern Lightweight Aggregate Corp., Richmond, Va., produces "Solite," controlled lightweight aggregate that is favorably known in the Southeast. The parent company's first venture into the lightweight aggregate field was a rotary kiln plant at Bremo Bluff, Va., described in ROCK PRODUCTS, July, 1949, page 101.

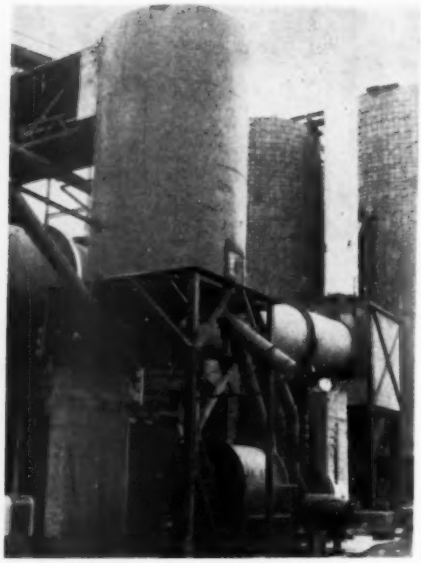
Since the first description of the plant was published, the Bremo Bluff plant of Solite has grown to be the largest manufactured lightweight aggregate plant east of the Mississippi river and possibly the largest in the United States. Bremo Bluff now has six kilns in operation around the clock. Five are 6½- x 100-ft. kilns, and one is 8- x 110-ft.

The economic and industrial development of the Carolinas during the past decade, with emphasis on the past three years, is one of the nation's outstanding areas of progress. Lithia minerals, mica, feldspar, garnet, syenite, kaolin, titanium and many more less well known industrial minerals are found in the area, all adding up to a growing and prosperous economy.

The area is liberally supplied with concrete block, concrete pipe, and ready-mixed concrete operations as well as important construction companies, all of which are aware of the advantages of this lightweight aggregate. For several years the Carolina Solite Corp. has been exploring the southeastern states for suitable materials with which to make a manufactured lightweight aggregate that would have the high standard of quality earned by the Bremo Bluff product. The deposit near Aquadale is one of several now owned by the company. The new plant at Aquadale, which went into operation in mid-November, 1953, is located along the Norfolk & Southern railroad.

The Aquadale raw material is classed as a Monroe slate which is a relatively hard material that has to be drilled and blasted prior to loading in the pit. The deposit has been explored to a depth of 180 ft. with still more

Left: A 20-ft. long apron feeder ahead of primary jaw crusher. Right: Interesting arrangement of conveyors with screen, above to the left, and 4-ft. cone crusher, below



Left: One of two ball mills for the pulverization of coal for kiln firing. Note probe and small hose in center which are part of constant level device. Right: Belt conveyors deliver coal to steel tanks over ball mills

slate probably under that depth. The slate tends to break blocky with all its laminated structure. It is gray in color and about the same shade as conventional dry portland cement. The following is a chemical analysis of the slate:

Free H_2O	0.41 percent
H_2O (comp.)	1.18 percent
S	.08 percent
C	0.54 percent
CO_2	3.47 percent
SiO_2	64.6 percent
Al_2O_3	12.9 percent
Fe_2O_3	1.72 percent
FeO	4.17 percent
MgO	1.36 percent
CaO	1.29 percent
Na_2O	1.28 percent
K_2O	5.9 percent
TiO_2	1.10 percent

The finished Solite is a tough, hard manufactured lightweight aggregate identical in characteristics to that produced by the Bremo Bluff operation. Solite from Bremo Bluff has proven its value throughout the Southeast. Two outstanding jobs using Solite were the 3¼-acre lightweight structural roof for the capitol at Washington, D. C., and the lightweight structural deck of the 3½-mile Chesapeake Bridge. The Aquadale Solite has all the characteristics and high virtues of the older material, being light in weight and providing high strength concrete with normal portland cement mixes, it is durable and sound, and has high insulating value. For roof slabs and decks, floor systems, structural concrete, etc., great reductions in dead loads are attained when Solite aggregate is used which results in less structural steel.

Stripping at Aquadale is confined to a variable but relatively small amount of soil overburden including small trees and brush. The site chosen for preliminary quarry operation is about 800 ft. from the primary crusher with hauls over nominal grades. The quarry has been opened up on the side of a relatively low prominence, and operations are conducted from a single bench with a working face that varies from 18 to 35 ft. of raw material. Primary drilling is with an Ingersoll-Rand wagon drill. Loading in the pit is done with a Model 6, 1½-cu. yd. Northwest diesel shovel. Koehring Dumptors and General Motors trucks do the hauling to the plant.

Loading slate in quarry with 1½-cu. yd. shovel

Calcining Operation

The Aquadale plant of the Carolina Solite Corp. uses two 7- x 8- x 135-ft. rotary kilns fired with powdered coal. Three used 8- x 125-ft. kilns are on hand for later plant expansion should that become expedient. The two longer kilns in use are possibly the longest in the manufactured lightweight aggregate industry.

Coal is delivered to the plant in open-top hoppers, and is unloaded by a Farquhar unloader that dumps to a short belt conveyor serving a bucket elevator. The elevator discharges into the silo that holds 600 tons of coal. Belt conveyors move coal from this silo to either of two steel cylindrical bins ahead of the pulverizers. All car shipments are analyzed for B.t.u. content to help the burner maintain uniform burning conditions.

Each rotary kiln is provided with a Kennedy-Van Saun pulverized coal preparation system, each unit consisting of a 5- x 6-ft. ball mill, exhaust fan, coal feeder and related equipment. Each ball mill is equipped with a Kennedy-Van Saun constant level device so that the amount of coal in the ball mill at any one time is kept constant. At the intake throat of the ball mill is a probe which connects with an electronic device in the control room with the assembly tied in

(Continued on page 86)

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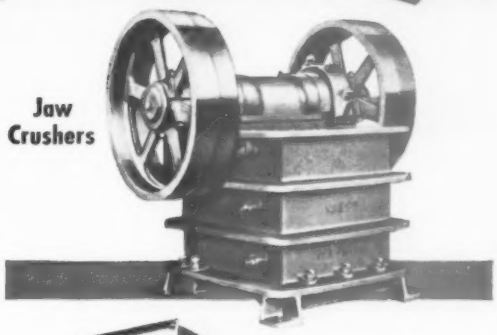
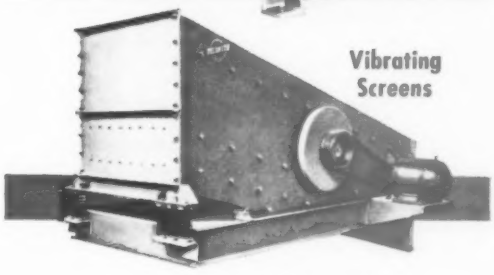
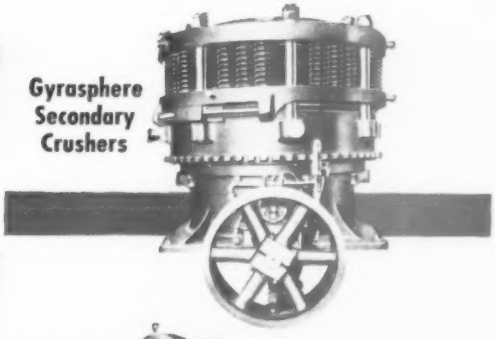

Jaw Crushers


Vibrating Screens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R. F. Gibson, general superintendent

with the coal feeder to the ball mill in such a fashion that the coal level in the ball mill does not vary except in the ¼-in. range, or thereabouts. This constant level feature, tied in with other constants (ball load, B.t.u. content of the coal used, r.p.m. of ball mill, moisture content of coal, etc.) results in a delivery to the burners of a constant amount of pulverized fuel. Hot air from the hood of the kiln is the circulating air supply with any entrained dust being removed by a small cyclone collector located near the firing end of the kiln. Two burners are used at each kiln with a short-flame accented. The flame tends to strike the lining of the kiln possibly 20 ft. back from the discharge end. Each pulverizer is powered with a 50-hp. General Electric motor.

Raw material is all minus 1½-in. slate and this size of material is stored in two silos that act as kiln feed bins. The silos are of concrete construction, using Solite, and each silo holds 1000 tons of kiln feed. Under each silo is a short, flat-running, belt conveyor that delivers to a vertical bucket elevator. Feed to the belt is through a gravity type gate. The feed belt and the bucket elevator move quite slowly and their speed (and feed rate) is integrated with the r.p.m. of the kiln. The faster the kiln turns, the more feed is received, and vice versa. In a similar manner, the coal pulverizing assembly is tied in with the r.p.m. of the calcining unit with all functions related thereto being automatic.

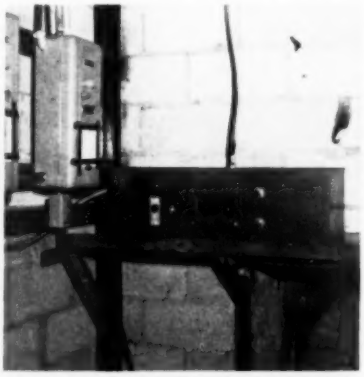
The maximum burning temperature is said to be 2400 deg. F. with temperature controls being by visual means. The kilns are installed on a slope of ¾-in. per ft. and each unit turns out 280 to 300 cu. yd. of material. The kiln operator controls the firing so that the clinker is a (deep) red hot material. The red hot clinker from both kilns falls to an open pit at the end of the kilns where the material cools naturally and without the use of water. Cooling in this manner is said to "temper" the clinker thereby annealing it and rendering it more inert.

The lining of the kilns consists of 113 ft. of Solite concrete with the hot zone lined for 22 ft. with Harbison-Walker refractories. Solite concrete is used on the hood and breachings as well. It takes about three days to line the 113 ft. of kiln with the Solite concrete. One half of the kiln is first poured after which the kiln is revolved half a turn and the other half poured. The concrete mix used is a 5000-lb. concrete, using essentially a 6-bag mix. The Solite refractory concrete has proven very satisfactory. The kilns are Vulcan units rebuilt to meet the specifications of the company's engineering staff. The trunnions operate without artificial cooling. Radiation from the steel jacket of an operating kiln is quite small.

Each kiln is driven through a variable speed motor through G. E. controls. Electric power is purchased. Electrical controls for the plant center at a small Solite concrete building under the kilns. The General Electric controls feature low voltage, remote-control, and automotive type units that are interlocked, with each station provided with a safety lock. The controls use 110 volts for starting with the units at 440 volts at full operating speeds. The use of low voltage starters is an important safety factor for a "short" in any part of the assembly is less apt to cause injury than is the case with the higher starting voltages. The structure housing the controls is provided with a louver-type door over which are air filters, and at the opposite end of the building an exhaust fan is provided. This insures an even flow of cool and dust-free air getting into the control room, and will help maintain a low and uniform operating temperature therein.

Crushing and Screening

The raw material for the kilns and the burned clinker are both processed, using the same equipment. Trucks from the quarry deliver to a long, Universal apron conveyor that serves the 30- x 42-in. Universal jaw crusher. Crushed material falls to an inclined belt conveyor serving a longer cross belt that delivers to two 5- x 12-ft. Seco double-deck vibrating screens. The plus fraction from the screens falls to a 4-ft. Symons short head secondary crusher. A return belt from the cone delivers to the second belt in the series to close the circuit. At the time of inspection only one screen was installed, but the second screen is now in service. The two screens operate in parallel receiving a split feed. The throughs from the Seco screens fall to a long inclined belt conveyor with the material carried over, and parallel to the kilns to the two kiln feed silos. This material is normally 0 to 1½-in., but if any size is desired to be scalped out of this product, provisions are available to do it. The scalped-out size falls to a steel pipe and is bypassed to trucks below.



Electronic control in sub-station is part of the constant-level equipment used in ball mill set-up for coal pulverizing

The crusher and conveyor assembly is built in a "U"-shape and is located immediately adjacent to the discharge end of the kilns. Near the center of the "U" is a stiff-leg derrick with an 80-ft. steel boom equipped with a 2-cu. yd. Erie clamshell bucket. A multi-drum, Clyde hoist, actuates the stiff-leg. The design is such that the clamshell can bail out the cooled clinker and deliver it to the Universal apron feeder unit previously mentioned. This apron is 20-ft. long. The unusual length permits the stiff-leg derrick to pick up cooled clinker from either small pile in the pit at the end of each kiln, or, if clinker is stored alongside the pit, as sometimes is the case, the stiff-leg can do it without having to raise or lower the boom.

The crusher assembly and screens normally prepare three materials for shipment. For the concrete masonry trade an 0 to ⅜-in product is processed. For monolithic or other types of concrete a ⅛-in. to ¾-in. Solite and a minus ⅛-in. sand is processed. The ⅛-in. to ¾-in. Solite from Aquadale weighs 55 lb. per cu. ft. The minus ⅛-sand weighs in the 68 to 69-lb. range, and the 0 to ⅜-in. for concrete block weighs 60 to 63 lb. per cu. ft. All material is loaded as produced with no intermediate bin storage provided. When sand is removed it is chuted down the previously mentioned bypass pipe to trucks. Plans are afoot to install a belt conveyor system so that sand and the coarser aggregates can be loaded to cars simultaneously. Practically all shipments go out by rail. No stockpiling is contemplated. The conveyors used are Hewitt-Robins for that section of the plant to and from the screens in the grinding circuit. The finish conveyor and some of the other conveyors (feeder belts) are Barber-Greene. The main belts are designed for high temperature work and are Hewitt-Robins for the most part.

Personnel

John W. Roberts is president of the Southern Lightweight Aggregate Corp., and of the Carolina Solite Corp. with head offices in Richmond, Va. A. Cabell Ford is director of sales. R. F. Gibson is general superintendent and J. S. Gunn is assistant superintendent. The Carolina Solite Corp. maintains a sales office in Charlotte with Charles B. Laws as sales representative.

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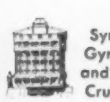
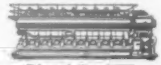


Symons Gyratory and Cone Crushers

Mine Hoists

Symons Vibrating Grizzlies and Screens



Diesel Engines

C 154

View of plant taken from top of quarry. From left to right: Garage and machine shop, main mill building, and to extreme right, the primary crusher. Surge pile is in front of plant. In background along James River is plant of another company

Producing Pulverized Dolomite Products

By BROR NORDBERG

James River Hydrate and Supply Co., Buchanan, Va., has 10 roll-type, air-swept mills manufacturing agricultural and chemical products down to micron size

SINCE COMPLETE DESTRUCTION OF ITS OLDER PLANT by fire in 1943, James River Hydrate and Supply Co., Inc., Buchanan, Va., has developed a plant operation that is rather unique in that it specializes almost entirely in fine ground chemical dolomite products. These products range in fineness from agricultural limestone, which is pulverized to minus 10 mesh with 50-70 percent through the 100, down to chemical dolomite of three micron size.

The name of the company implies that it is a producer of burned and hydrated lime, which stems from its beginning when a plant had been built at the present location to burn lime. Established back in the 1870's, the first plant was operated under the name of E. Dillon Sons and was exclusively a high calcium lime plant.

Main mill building showing some of the classifiers for grinding mills

In 1933, a fault was encountered in the quarry which resulted in loss of the high calcium strata. The area is unusual in that dolomite prevails on the plant side of the James River, with high calcium limestone on the opposite side. Most of the limestone in the state is the high calcium variety. Dolomite was burned in vertical kilns until the time of the fire, but the business was limited, and the company then made the decision to exploit the high-grade properties of the raw stone in its quarry.

Known as the "Shady Dolomite," the stone was precipitated from sea water, and is practically a true dolomite with 54-55 percent $CaCO_3$ and from 40-45 percent $MgCO_3$. Silica is generally less than 1 percent and always less than 2 percent. R_2O_3 ranges from 1 to 2 percent. A typical analysis is as follows:

SiO_2	1.20 percent
R_2O_3	1.92 percent
$CaCO_3$	53.90 percent
$MgCO_3$	42.36 percent

Quality of the stone is highly suitable for the production of pulverized products for chemical and agricultural use. It has a calcium carbonate equivalent of 106 percent, far surpassing the 85 percent minimum required for agricultural limestone. Its purity is desirable for various chemical uses and as a filler. Physically, the stone varies in hardness and toughness, but the deposit is such that

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(Names of above firms on request)

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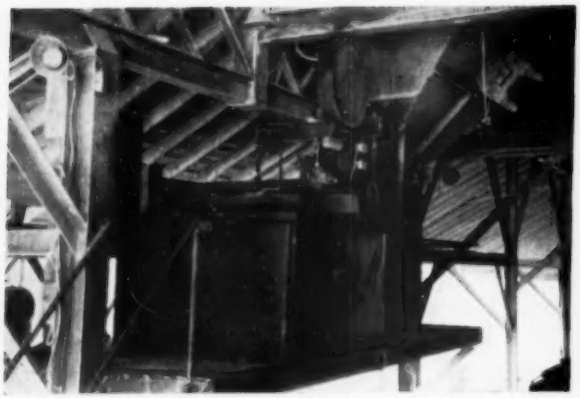
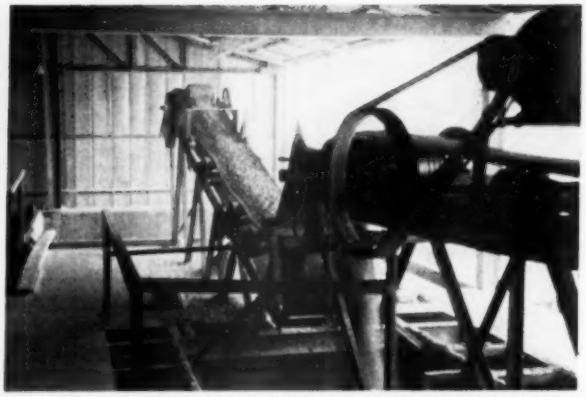




Left: Bulk materials are weighed and weights recorded by this loading feeder. Freight cars are to the right. Right: A system of 24-in. belt conveyors with transfer chutes between is the means of filling pulverizer feed bins

selection is easy in the quarry. Practice is to grind stone of the softer characteristics into chemical grade products, and to process the harder "blue" stone into flux, railroad ballast and commercial crushed stone. From 92 to 93 percent of total production is in pulverized products.

The plant was built to its present capacity in stages and it has been added to, over the years, without benefit of engineering services nor help from outside the company organization. Today, it represents an investment of approximately $650,000. It is alongside the main line of the Norfolk and Western railroad, Shenandoah Division, and ships over a wide area into several states. There is a primary crusher structure, and a main building 346 ft. 6 in. in length which houses the re-crushing, screening and most of the pulverizing machinery. This main building parallels the railroad trackage alongside, and has a well-equipped machine shop and garage in its far end. A separate structure houses three of the mills.

Layout was planned to permit adding more pulverizing equipment as the demand warranted. This has been done over the years, and there are now ten 50-in. Raymond mills in service, which is probably the largest number of such mills in a single crushed stone plant. There are seven mills in a single row paralleling the long axis of the main building, and more could be easily added by merely extending the building. Two of the mills in service before the fire are still operated. All but one are 5-roll high side mills, swept by heated air and with standard-type overhead whizzers for size separation. The tenth mill is a 4-roll high side mill. Each has its separate overhead feed bin of 120-ton capacity. They have identical capacities at any given fineness and parts are interchangeable.

The first mills were installed in 1935 (2), and single installations followed in 1936, 1938 and 1945. Two more were added in 1946, another in 1949 and the last two in 1951. Being air-swept mills and with a row arrangement, the plant gives the impression of efficiency and it is remarkably free of dust. Each pulverizer unit has a 100-hp. mill motor, 50-hp. fan motor, 10-hp. whizzer drive and 1-hp. feeder drive.

Quarry Operations

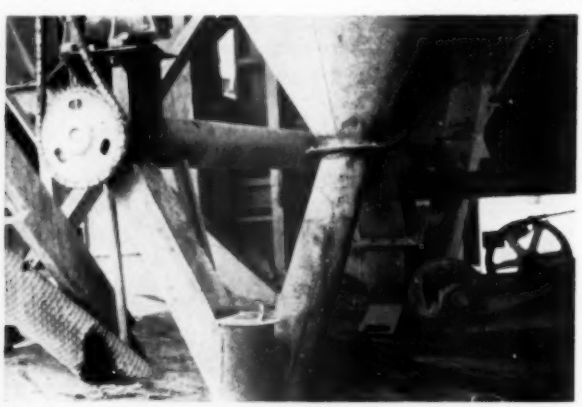
The plant is between the railroad and its close-by source of stone which is a mountain of dolomite being worked in lifts. Eventually, the deposit will be developed to a total face height of 350 ft. Six lifts are now being taken using wagon drills, drilling an average depth of 18 ft., and supplemented by jackhammers. Stripping and excavation are done by two Bucyrus-Erie B-38 diesel-powered shovels with 1½ cu. yd. buckets. Haulage equipment includes two 15-ton, end-dump Euclid trucks and four Koehring Dumptors. Other quarry equipment comprises a D-8 Caterpillar tractor, an Allis-Chalmers tractor, and there are six 2-ton Chevrolet trucks.

Stone is hauled a short distance to the primary crusher where the haulage units dump into a hopper from which a 3- x 12-ft. apron feeder feeds a 30- x 42-in. Traylor jaw crusher set for a 4½-in. opening. A 30-in. belt conveyor delivers the crusher product to a 4- x 12-ft. Tyler triple-deck scalping screen mounted over bins in one end of the main structure.

Crushing and Screening

This screen has 3-, 2- and 1-in. square-mesh openings on its three decks, consecutively, and delivers stone into either of two bins. These are feed bins for three secondary crushers, and the arrangement is flexible to divide the feed to the separate crushers. Crushers include a 4½-ft. standard Symons cone crusher and a 3-ft. Symons short-head cone crusher, both below one bin, and a No. 14 Kennedy gyratory crusher under the second bin.

(Continued on page 93)



Left: Grinding mills are neatly arranged in a row down long axis of mill building. Right: Two mechanical separators skim off the fines from whizzer production from three mills in producing extremely fine product. Here is shown arrangement for putting fines from both separators in one bin and coarse fraction into a second bin

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—ENGINEERING NEWS-RECORD

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The quotation at the top of this page is typical of impartial observers who have seen the new Barber-Greene MIXALL perform. There is widespread agreement among editors, road builders and government officials that the need for a machine capable of on-the-spot production of even the highest type hot mixes has been answered by the development of the MIXALL.

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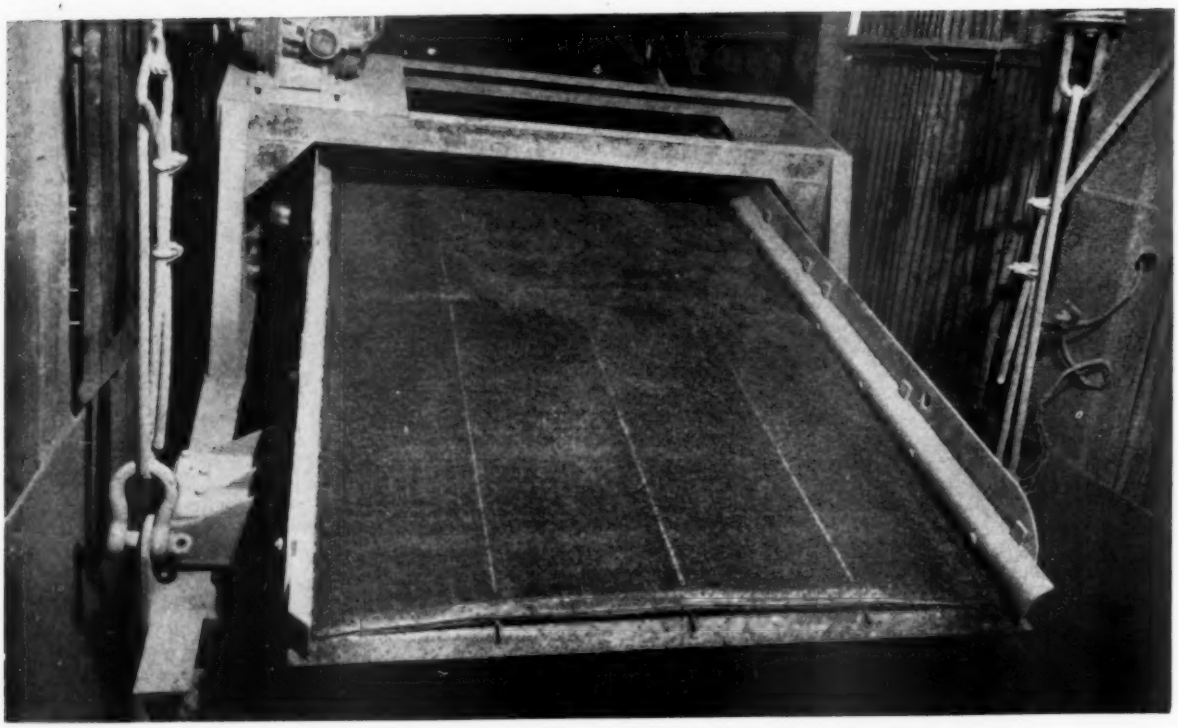
SECO SCREENS AG-LIME

PRODUCES 50 T.P.H. AT DOLOMITE GATES, N.Y. PLANT



Photographed on the job, Dolomite Products Company, Gates, New York

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Normal practice is for the oversize to drop into one bin, the 1- to 3-in. product into the second one, and for plus 3-in. stone to be fed the large cone crusher. The 1- to 3-in. stone is usually divided between the gyratory and short-head cone crushers, but the gyratory can also take plus 3-in. feed material. Product of the crushers is elevated overhead to a 4- x 12-ft. triple deck vibrating screen where two sizes of fluxstone or railroad ballast may be screened. Oversize (plus 1-in.) may return to either of the smaller crushers and is then re-screened. Any of the three crushers can be shut down when the plant is at a reduced rate of production, and the bin capacities are such as to provide a reasonable reserve for grinding mill operations, should the primary crusher be down.

Minus 1-in. material from the scalping screen and the second screen is put over a third screen where a minus 10-mesh product can be screened out and placed in a bin by belt conveyor for later blending with a Raymond mill product in the production of some of the coarser ground materials. A ¾- to 1-in. product and a ½- to ¾-in. size are taken off. A fourth screen usually carries ½-, ⅜- and ⅛-mesh cloth for the production of chip sizes. Minus ¼-in. material is conveyed into a fertilizer filler bin.

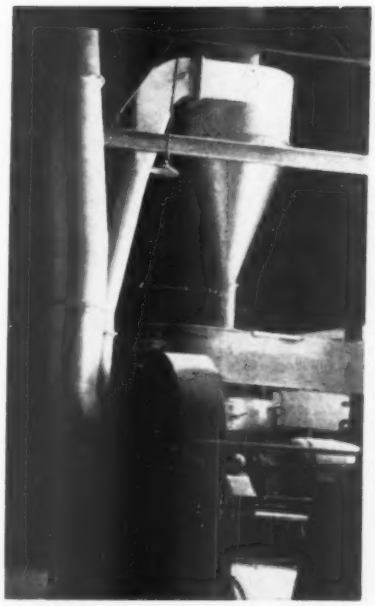
Feed for the Raymond mills is ¾-in. top size, sometimes with the minus 10-mesh fraction removed, and is taken off the first sizing screen and conveyed by 24-in. belt conveyors into the separate bins over each grinding mill. This is done by a system of 24-in. belt conveyors which have transfer chutes at their head pulleys to permit passage to the second belt in sequence and so on, or dropping of the stone into any bin by raising the transfer chute.

Should the secondary crusher feed bins be full, a stacking belt conveyor is the means of building a stockpile alongside the plant as a reserve to keep the screening and grinding plant supplied with stone in the event the quarry not be operated. At present this stone is reclaimed into trucks and returned into the plant flow; it is planned later to install a reclaiming tunnel belt conveyor for return to the bucket elevator.

Fine Grinding

Raymond mill feed bins are of identical size, of block construction and were built of sap lumber. Two extra bins were provided which are not in service.

Among products produced are asphalt filler (85 percent minus 200-mesh) for sand asphalt surfacing, mine dust pulverized to the same fineness, agricultural limestone up to 75 percent minus 100-mesh and fertilizer filler (50 percent minus 100-mesh). Other products for chemical use are ground to 92 or 93 percent passing a 200-mesh sieve and, in addition, the previously mentioned 3-micron size material is produced for sale to a large chemical company.



Close-up of one of 10 pulverizers in the plant

All pulverized products are classified as to size through the whizzer separators with the exception of the extremely fine product. Furnaces for heating the air to sweep through the mills in producing high grade chemical products are fired by coke, and the rest are fired by bituminous coal. Temperature of the heater air stream in each case ranges from 165 deg. F. to 225 deg. F.

The 3-micron product must be completely dry and it is preferred by the customer that it be a light buff in color. In producing this product, the whizzers from three mills discharge their product, up to 97 percent minus 200-mesh, into an overhead feed tank from which screw conveyors convey the material into two Raymond super mechanical separators which are operated in parallel. One is 10 ft. in diameter and the other measures 8 ft. The fines are skimmed off through these separators into a closed hopper. The rejects drop into a second closed hopper. They have a fineness of 85 percent minus 200-mesh and are asphalt filler. Alternately, the mechanical air separators may be by-passed, and then the product of the whizzers from these mills is then discharged into the "coarse" material bin.

One of the coarser products is a blend of minus 50-mesh ground product with 10-mesh fines screened off from the crusher-run stone. Another product is a blend of potash (6-10 percent) with agstone for a combination liming-fertilizer product. The two materials are weighed out from separate tanks and the blend is put into a packing machine tank. Fertilizer filler is produced to meet various uniformity requirements for moisture. This product is loaded out in bulk by a bulk loading weighing machine with the moisture applied by sprays to the product on the loader belt.

The plant is set up for bulk loading into railroad cars, and has four 2-spout St. Regis valve packers for bagged material. Agricultural dolomite, asphalt filler and mine dust are largely shipped in bags. Fertilizer filler is shipped in hoppered cars, and a small amount of agricultural limestone is shipped in bulk.

Gravimetric Feeder for Weighing Bulk Materials

One of the newest pieces of machinery in the plant is a Syntron Gravimetric feeder with Toledo scale for the weighing of bulk materials as loaded into cars, which was installed to eliminate over- and under-loading. It is of the vibratory type with constant-speed belt, on which moisture is added in the case of fertilizer filler material. Weight of the material is recorded as it passes over the scale and the accuracy is within 2 percent.

Pulverized products are shipped into eastern and southeastern Virginia and into eastern North Carolina and South Carolina. Mine dust is shipped to coal mines throughout West Virginia.

Each pulverizer produces 7 to 8 t.p.h. of the various products in the average size ranges. In producing 3-micron material, which is used for synthetic neutralization of acidic components in commercial fertilizers, the output is 40 tons in 18 hr. for the three mills. Production is scheduled for 8 hr. of crushing operations to supply material for 24-hr. operation of the pulverizers. Top production is 41 to 43 cars (40 tons) per day.

The plant is in rugged mountainous country some 20 miles north of Roanoke, but is not readily accessible for outside repair and maintenance services so it has highly skilled mechanics and a fully equipped machine shop which makes it possible to make the major part of required repairs. Among the equipment are a 300-ton hydraulic press, pipe cutter and threading machines, lathes, a shaper, milling machine, and miscellaneous other equipment. Two machinists in the shop constitute the maintenance crew and they are qualified to make emergency replacement idlers, sprockets, pinions, keyways, shafts, splines, bushings and other essential parts. At the far end of the shop is a 60- x 30-ft. garage which is fully equipped with supplies to make repairs on heavy equipment. Power is supplied by the Virginia Electric and Power Co.

F. C. Acree is vice-president and general manager of the company. Other officers are L. P. Dillon, president; John D. Carr, vice-president; and Carl Hanmer, secretary-treasurer. W. P. Keesee is superintendent, C. E. Wells is assistant superintendent; and C. B. Manley is office manager at the plant.

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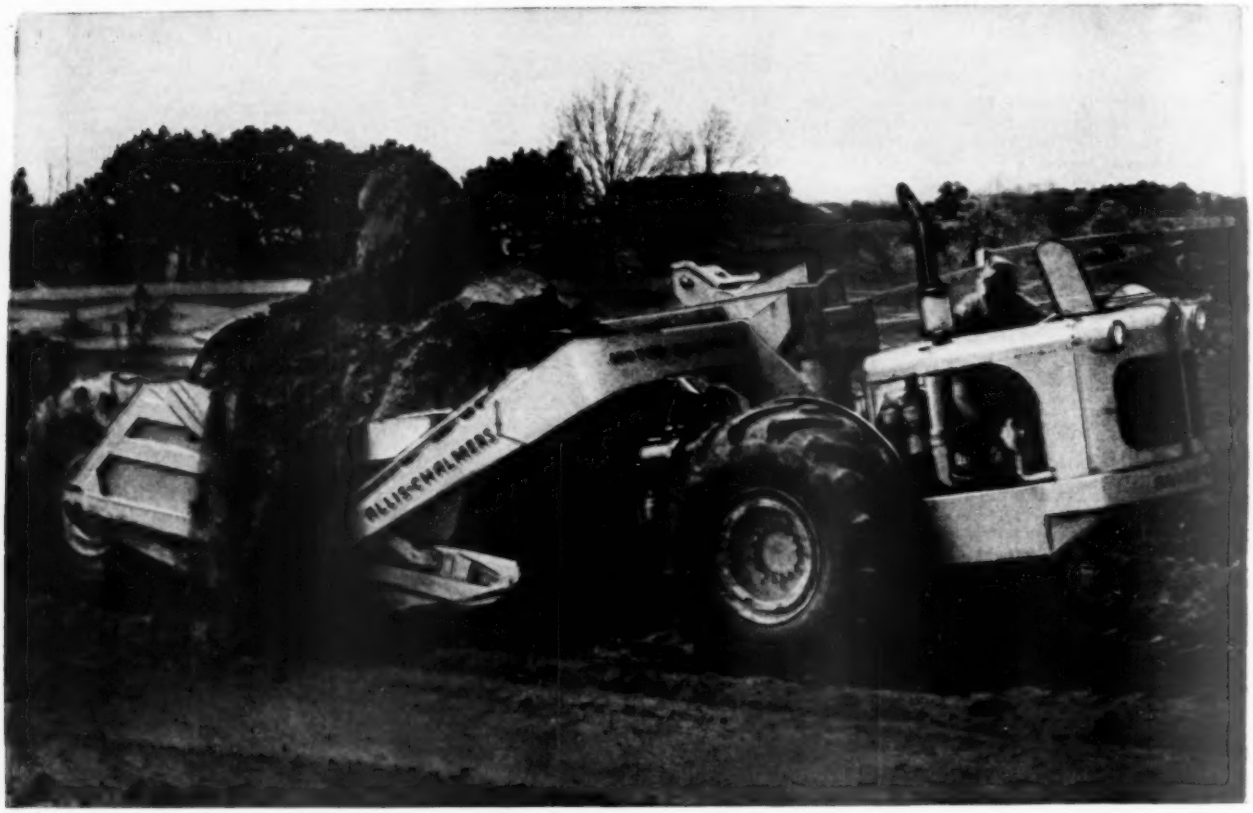

Modern equipment helps cut your operating costs in today's competition. Let your Allis-Chalmers dealer demonstrate how the Motor Scraper actually saves time on every trip, gives you extra yardage every shift.

	Hp.	Struck Cap. Yd.	Heaped Cap. Yd.	Wt. Lb.
TS-300	280	14	18	47,900
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Allis-Chalmers Motor Scrapers have up to 20 horsepower for every yard of struck capacity — for fast loading. A curved bottom and offset cutting edge boils the dirt in *fast* . . . completely fills the bowl and packs yardage-robbing corner voids.

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Positive, forced ejection "bulldozes" dirt out on the run, spots or spreads it right where you want it. Ejector rides on a three-point roller suspension . . . assures complete dumping of sticky loads. High apron opens to a big 8 ft. 6 in.

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The powerful HD-20 hydraulic torque converter tractor is an ideal team mate for your Motor Scraper. It automatically balances its speed to that of the scraper, makes full use of tractor horsepower at all times, avoids strain on the operator and equipment . . . gives scraper an extra fast start to the fill.

Secondary drill in use at the Neverson quarry of the Bryan Rock & Sand Co., near Raleigh, N. C.

Operating Results With Secondary Drill

Drilling machine, developed originally by quarry operator, now being used in many types of quarries

By WALTER B. LENHART

DURING JANUARY of 1951, the writer learned about a new type of secondary drill in operation at the quarry of the Greystone Granite Quarries, Inc., near Henderson N. C. Shortly thereafter the Greystone quarry was visited, and W. E. Johnson, the inventor of the novel equipment, demonstrated the pioneer unit in operation. Like many early inventions, the equipment was home-made and obviously built on the installment plan using various pieces of machinery that happened to be available. However, even if the rig did not have the streamlined appearance of the later drills, it was an efficient piece of equipment.

At the time of the demonstration at Henderson, a second drill was under construction. It was to be more sightly and with many of the earlier bugs removed. At the specific request of Mr. Johnson, ROCK PRODUCTS refrained from any early publicity until the second drill was in operation. In the March, 1953, issue of ROCK PRODUCTS there appeared the first and exclusive description of the drill in a feature article prepared by Mr. Johnson, the inventor.

During December, 1953, and in January, 1954, the writer returned to Raleigh and gathered the performance data on several users of the Travel drill. The first drill placed in service at Greystone was still in operation, having just passed its second year of use. Performance data was gathered on its use at the Neverson, Rolesville, and Crabtree operations of the Bryan Rock & Sand Co., at the Red Hill operation of the Superior Stone Co., and the Beverly quarry of the Campbell Limestone Co., Liberty, S. C. Because of the mobile features of the drill rig, it appears to be standard practice for drill owners to shift it from quarry to quarry as needs arise. As an illustration, the Bryan Rock and Sand Co. has two units. One was observed in operation at the Neverson quarry, and the second at the Rolesville operation.

The Travel drill owned by the Superior Stone Co. is in use at the Red Hill, Va., operation and according to H. C. Mayes, general superintendent for the group of Superior Stone Co.'s plants in the Carolinas, the drill has established its worth. It was reported that 2367 ft. of drilling had been accomplished at Red Hill by two drill bits.

None of the quarry operations visited had changed their primary drilling practice to meet the newer conditions of a more efficient secondary drilling rig. Enough large boulders were available from blasting operations to keep the Travel drill busy.

The Travel drill is built primarily for secondary drilling, and in each of the quarries mentioned it has replaced from 6 to 8 hand held drills.

Operating Features

It is a completely mobile drilling unit, mounted on rubber tires with two heavy front wheels and a third wheel about midway under the main structure. This design permits quick turning and on short radii so as to maneuver the unit in and around the boulders to be drilled. To the rear over the frame supported by the three wheels is a Gardner-Denver two-stage, 230 c.m.f. air compressor powered with a D-318 Caterpillar diesel engine. On the front of the main assembly is mounted a 40-ft. boom. This boom carries an enclosed operator's "chair." Immediately in front of the chair is mounted a Gardner-Denver 3-in. drifter. The operator seated in the chair controls all the operations of the three-wheeled truck, the drill, and all features pertaining to the operation. Once the engine is started

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the operator does not leave the chair. Through a series of hand levers and foot pedals, he operates the heavy drill (and chair) up and down the boom, moves the boom laterally, through an arc up to 104 deg. or raises and lowers the boom and even drives the truck assembly about the quarry floor. Having a heavy drill, operating under positive pressures and with tungsten carbide bits, all tied in with a high degree of mobility, obviously accounts for the high performance records of this drill. Due to the way it is mounted on the assembly, it can reach boulders 33 ft. above the ground line and as far as 44 ft. from the toe of the muck pile. Large rock fragments, that would ordinarily have to be barred down as a safety precaution, can be drilled in the face without any hazards whatsoever. Hole collaring at a 90 deg. angle is almost instantaneous and from one to four sec. for holes at 45-deg. angles. The operator is far enough away from the drill that dust and cuttings do not reach him. Shovel operators do not have to position boulders for drilling. When it is desired to transport the drill over the highway for any appreciable distance, it is recommended that the unit be partially dismantled and loaded on a carrier. Dismantling may not be necessary if power lines, bridges, etc., have sufficient clearance for the boom supports. One operator advised that it took him about two to three hours to get the drill ready to take to the road on a carrier where the unit had to be partially dismantled. Under other circumstances the rig can be towed with a truck with a tow bar supplied by the manufacturer.

At the Neverson quarry up to 400 holes per day are drilled, using 1⅝-in. steel and a Model D-79 Gardner-Denver drill. The bits are tungsten-carbide tipped units from Rock Bit Service Co., Ashville, N. C., and Ingersoll-Rand jackbits. The man operating the rig at Neverson was relatively inexperienced in handling the machine. In this granite a hand held air drill drills a 2-ft. hole in about 6 min.; with the Travel drill it takes about one minute. Primary drilling at Neverson is with two Ingersoll-Rand Quarrymaster drills. The plant has a capacity of 500 t.p.h. T. D. Bailey is general manager of the Bryan Rock and Sand Co., and James Raybon, superintendent at Neverson assisted by O. S. Trail.

At the Rolesville quarry, J. R. Lairson, drill operator had about four months experience in handling the machine at the time of inspection, and had drilled as high as 285 holes in half a day with holes ranging from 8 in. to 3 ft. in depth using a 1⅝-in., 4-winged tungsten-carbide bit. The drifter is an L-79 Gardner-Denver with a 230 c.f.m. air compressor. The quarry formerly had 12 jack hammer operators and now has four. The Rolesville rock is a granite with a 48-52 Los Angeles rattler test rating. Primary drilling is with a Quarrymaster drill that drills a 5½-in. hole. It drills at the rate of about 8 to 10 ft. per hour for the first 35 ft. of hole, and drops to 6 to 8 ft. for the rest of the drilling. The face is 81½ ft. high.

In the data that follows a series of tests were made by members of the staff of a western cement manufacturer with the work carried out at the Rolesville quarry. The tests were made during July 1953 and are tabulated below as Test No. 1.

Test No. 1

Hole No.	Drill Time	Depth Inches
1	.41	12
2	.72	19
3	.72	15
4	.67	18
5	.42	12
6	.74	21
7	.28	7
8	.68	15
9	.60	14
10	.81	24
11	.56	16
12	.94	30
13	1.03	25
14	.56	16
15	.48	15
16	.48	13
17	.55	14
18	.50	12
19	.53	16
20	.77	22
21	.71	21
22	.78	24
23	.54	15
24	1.05	32
25	.65	16
26	.41	14
27	.45	14
28	.59	16
29	.75	20
30	.57	17
Total	18.95 Min.	525 In.

1⅝-in. Bit

Start 1:24 p.m.)
Finish 1:59 p.m.) : 35 Min.

$\frac{525}{12} = 43.75$ actual feet drilled

$\frac{43.75}{18.95} = 2.32$ ft./min. or 27.75 in./min. actual drill time

Over All:

$\frac{525}{35} = 15$ in./min. or 1.25 ft./min.

75 ft./hr. over all average

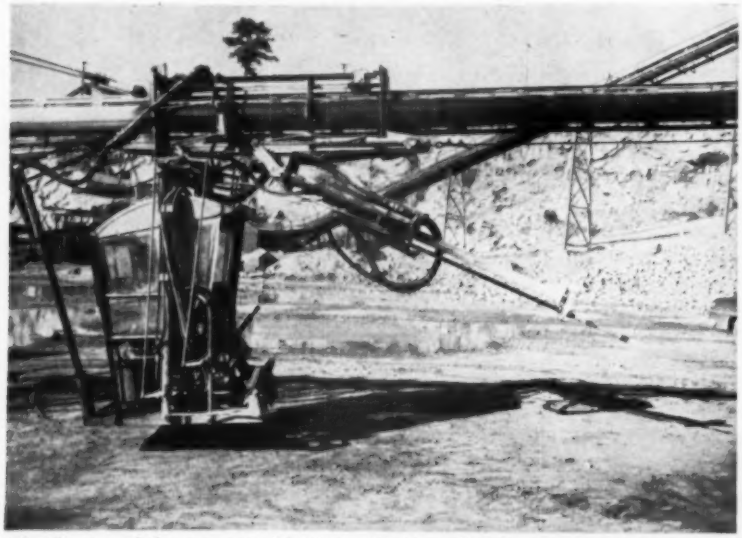
Average depth $\frac{525}{30}$ in. = 17.5 in.

The Campbell Limestone Co. has a Travel drill in service at the Beverly quarry, Liberty, S. C. The drill went into operation during November, 1953, and has replaced six jackhammers.

These operators use two men on the Travel drill. In this manner they always have an experienced man available to run the rig, and they find that some time is saved by having a man on the ground to help change the steel, thereby making it unnecessary for the operator to get out of the chair for that purpose. Also, during cold weather the operator can get chilled seated in the chair for any appreciable length of time.

Robert S. Campbell, Jr., president of the Campbell Limestone Co. says that other advantages have accrued through the use of the drill that are not so apparent. One of these is the reduction in insurance paid by eliminating that type of labor that takes the

(Continued on page 101)



Left: Close-up of the operator's "chair" on drill from which he controls movement up and down boom and position of drill bit. Right: Drilling a boulder at Rolesville quarry of Bryan Rock & Sand Co.

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There are over 1200 "Eucs" on Minnesota's Iron Ranges—more than all other makes of off-the-highway trucks combined! Rear-Dumps, ranging in payload capacity from 15 to 50 tons, work the year around hauling ore and heavy overburden. On this tough "proving ground" Euclid performance has consistently paid off in more production and lower hauling costs.

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Lessmann LOAdALL scoops up big loads of the most heavily compacted soils, cinders, aggregate, etc. . . . does it in 5 seconds while standing still! Extra hydraulic cylinders supply Hydraulic Power Crowd. This means *loading* with hydraulics which eliminates ramming and spinning of wheels . . . *minimizes repairs, reduces maintenance!* Dozer blade is easily attached for grading, backfilling. Crane-hook, lift forks, snow and trash buckets are also available.

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LOAdALL has clearance for the highest trucks, bins and mixing hoppers. It loads or unloads at any height from 12" below wheel level to 108" above. Wheelbase of 73" and 12' turning radius make it highly maneuverable.

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Secondary Drilling

(Continued from page 98)

highest insurance rate and points out that jackhammer operators are in the high-risk bracket. He also finds that the new drill speeds up the large capacity shovels used in his quarry. The shovels do not have to place any big rock, it simply tosses them to one side, or leaves it in the face for the Travel drill to work on.

It also has been found that less steel is broken and the loss of short lengths of drill steel has been reduced to practically zero. Mr. Campbell holds that the most economical way to break rock is by primary shooting even if it does produce more dust or fines. Loading of holes drilled in the face is by ladder. The chair and travel drill are not used for loading the higher drill holes for; (1) it ties up an expensive rig doing unnecessary work, and (2) it may not be safe unless the drill is adequately grounded. The electric shovel in the quarry is grounded at points outside the quarry.

The granite at Liberty has a Los Angeles rattler rating in the 48 to 52 range. Primary drilling is done principally by a battery of 27-B Bucyrus-Erie churn drills. The face of the quarry is about 80 ft. high. The rock tends to break blocky and some jackhammers are still kept in service. Primary haulage is with Easton side dump wagons. The primary crusher is a 42-in. Allis-Chalmers gyratory.

Test No. 2 was conducted by J. D. Stowe, general superintendent of the Rolesville operation and Test No. 4 was by an operator who had had about 10 hr. previous experience with the Travel drill. Test No. 5 was conducted at Greystone, N. C., by the Greystone Granite Quarries, Inc.

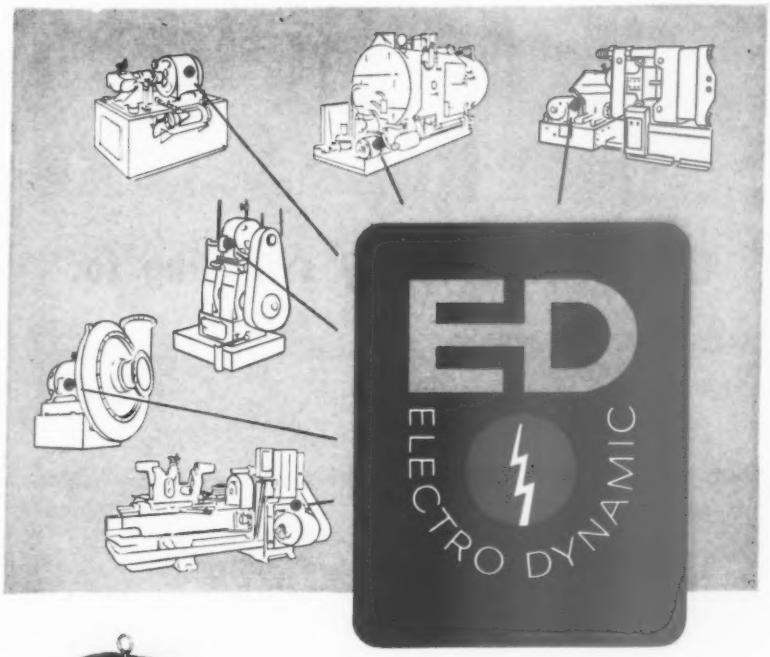
Test No. 2

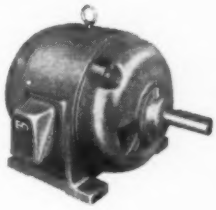
Conditions: Drilling boulders set back of shovel.
Drilling speed: 2.28 in./min.—Actual drilling time.
Total Boulders Drilled: 68
Average Depth per boulder: 15 in.—Total 85 ft.
Total Time Consumed: 4 hr. 28 min.
Average Boulders per man: 17
Travel Drill Test for: 1 hr. 40 min.
Drilled a Total of: 87 Boulders.
Average depth: 17 in.—Total 123.25 ft.

Test No. 3

Location: Rolesville, N. C. Quarry
Conditions: Boulder around toe of shot made July 28
Travel Drill Test: 1⅝ in. 4-Point Carbide Bits
Number boulders drilled: 117
Total Time: 2 hr. 12 min.
Average depth: 14 in.
Total footage: 136.6 ft.
Average boulders per hr.: 46
Average feet per hr.: 54.6
Time Average on Actual Drilling:
Actual drilling time for Travel drill: 23.93 in. per min.

(Continued on page 119)





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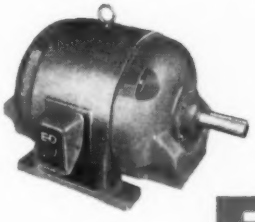

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9-part machine-braided wire fabric. Will not materially damage fabric when kinked or knotted! Favorite with those that demand safety and lower costs!

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Tuffy Dragline

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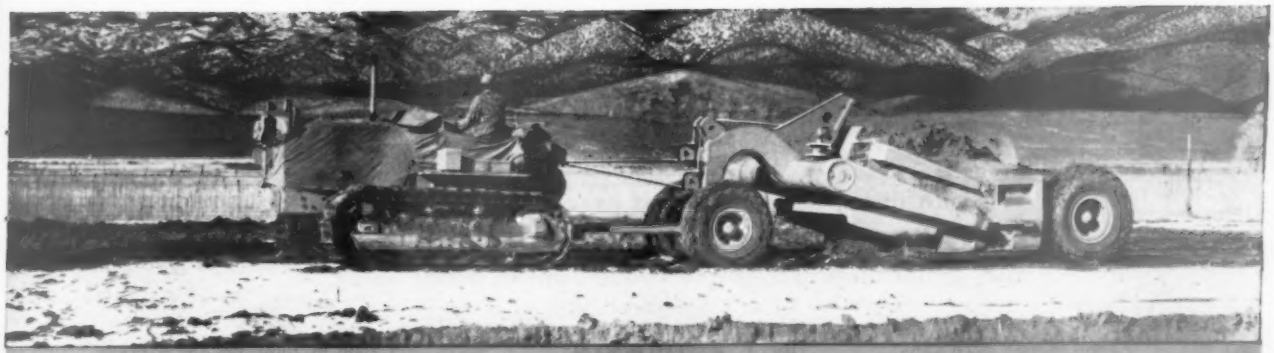

Scraper work, such as building this farm-to-market road, puts much strain on rope . . . causes stresses that ordinary wire rope just can't take for long. TUFFY SCRAPER ROPE is specially pre-shaped to apply the *full strength of every strand* to the rope load!

Highway construction jobs often run into tough spots like this water-filled pot hole. Moving the heavy, gummy clay to fill it for a good road bed imposes a terrific strain on scraper rope. On jobs like this the flexibility and super strength of TUFFY SCRAPER ROPE really pays off.

The power of a crawler in front and back of a scraper is needed in some cases to hack out the dirt when preparing runways for jet planes. TUFFY SCRAPER ROPE plays a most important part. Its long life does away with expensive downtime caused by rope failure. The construction of TUFFY SCRAPER ROPE is so designed to give you long and economical service!

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Sand and Gravel Industry

Produces Largest Tonnage of Minerals

With an annual production of over 400 million tons, the sand and gravel industry exceeds all other non-fuel mineral industries and ranks high in dollar value

By J. R. THOENEN*

AT THE BEGINNING OF THE 20TH CENTURY the sand and gravel industry was one of the smaller mining branches, with a recorded annual production of about 1½ million tons valued at a little over a million dollars. In the past half century it has grown to a point where it exceeds all other nonfuel mineral industries in tonnage produced (400,000,000 tons in 1951) and ranks among the highest in dollar value.

Although a low-priced material, the stringency and comprehensiveness of the specifications its products must meet and the problems involved in meeting them offer a challenge to the best attention and skill of the mining engineer and the ore dresser.

Summary

The sand and gravel industry is widespread throughout the United States, with potential or actual production in every county of the country.

The industry is versatile in that it embraces both small (one- or two-man operations) and huge corporations with 20 or more large producing plants.

In excavation methods the industry uses all the tools and methods of mining and excavation employed in open-pit or underwater recovery. In processing its crude product for market, it employs nearly all the tools and methods of the ore dresser.

Sand and gravel have become as essential to the national economy in peace or war as the construction industry itself. The industry is largely mechanized and produces nearly 5 short tons of marketable material for each man-hour worked, or 40 tons per day per employee.

Roughly 85 to 90 percent of the production enters the construction industry as fine or coarse aggregate—involving cement, bitumen, or other type binders—or as road metal without binder. The remaining 10 to 15 percent is marketed for molding, glass, engine, and abrasive sand or other minor uses.

The bulk of production is marketed at prices under $1 per ton; hence it is essentially a local industry depending on nearby rather than national markets. Imports are negligible and represent principally small tonnages produced near and sold across national borders. Small tonnages of sand for special purposes, commanding relatively high prices, are imported from transocean sources. There are no recorded exports.

The solidity and progress of the industry are exemplified in that slightly over 2000 plants were in operation in 1931, and the number had increased to only 2500 in 1950, yet the average production per plant in 1931 was 60,000 short tons annually and in 1950 this figure had increased 50 percent to 90,000 tons.

The basic strength of the industry is illustrated by the fact that a curve representing the consumption per capita in continental United States has steadily increased from 0.3 ton in 1905 to 2.44 tons in 1950.

Many economic and technical problems confront the sand and gravel industry, which is conducting research in those problems involving the use of its products.

*Chief, Mineral Industry Division, Region VII, U.S. Bureau of Mines.

History, Distribution and Organization

Sand and gravel have been used by man for various purposes throughout historic time and probably much earlier. With the advent of lime, sand became important as a mortar mix. With the introduction of Roman cement, both sand and gravel increased in utility. However, the invention of portland cement and steel-reinforced concrete brought the use of sand and gravel to its present prominence.

The widespread distribution of the industry in the United States is illustrated by the fact that sand and gravel are being or have been produced from virtually all of its 3000 or more counties.

The growth of the industry is illustrated in Fig. 1, which shows the output in tons and value in dollars for the United States from 1905 to 1950. Table 1 further illustrates the wide distribution of the industry among the several States and Territories for the typical year 1950.

Table 2 shows the distribution of production by size of plant for 1949 and 1950, exclusive of that produced for their own use by Government agencies and railroads. It is interesting to note that during both years over half of the total number of plants were rated at less than 50,000 tons annually, and nearly half of the total production came from plants rated at less than 200,000 tons annual capacity.

In addition to the widespread production for commercial use, a very considerable tonnage is produced by municipalities, counties, states, the federal government, and railroads for their own use. Production in these

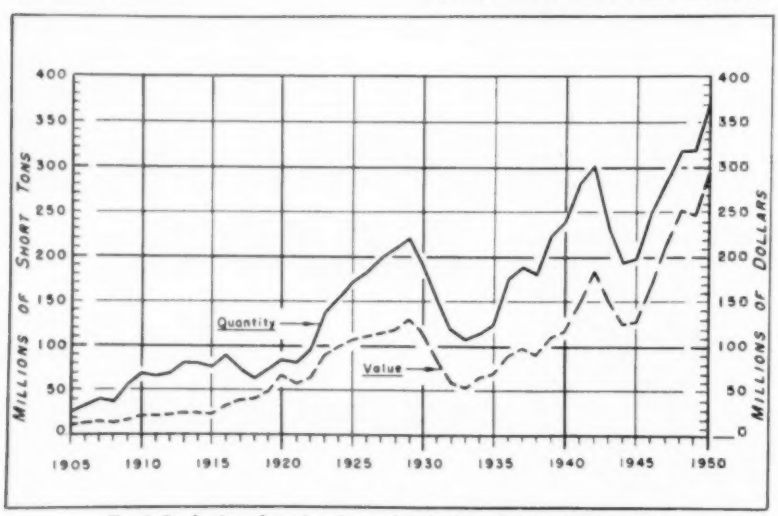

Fig. 1: Production of sand and gravel in the United States, 1905 to 1950

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TELSMITH Super-Scrubber and Vibro-King Screen

TELSMITH Sand Classifier and Sand Drag

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This plant produces about 125 to 175 tons per hour—making 4 sizes of gravel and 2 grades of sand at any one time, all meeting Ohio State specifications for asphalt and concrete. In freezing weather, the full crushing capacity of Telsmith Jaw and Gyrasphere Crushers is used to make minus ¾" crusher-run without operating the washing plant.

Here again Telsmith modern design and equipment produce low cost, quality aggregate. *Get Bulletin* 266. G-23

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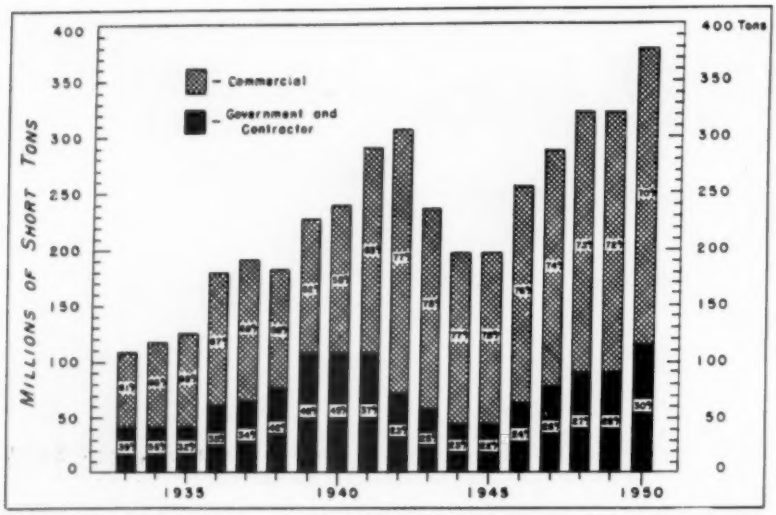

Fig. 2: Sand and gravel sold or used in the United States by commercial and government and contractor producers, 1933 to 1950

two categories is compared in Fig. 2.

In Table 3 the production for 1949-50 has been broken down for both commercial operators and the government-contractor groups by uses. This shows that about 85 percent of the sand and all of the gravel produced were used as aggregate for buildings or paving. The remaining 15 percent of sand production was used for various industrial purposes, as noted in the table.

Fig. 3 shows, graphically, the output of these industrial sands, 1916-1950. (See page 108)

The tables and figures on pages 104, 106, 108 have been presented to emphasize the wide geographic distribution of production, the wide range of capacity of producing plants, and the variety of ways in which sand and gravel are utilized.

An acurate definition of either sand or gravel presents some technical difficulties. A search of the literature uncovers a surprisingly wide variation among authorities, but the consensus would seem to be that sand is unconsolidated granular material, coarser than 200-mesh and finer than ¼ in., resulting from the natural disintegration of rocks and that gravel is the similar unconsolidated granular material, coarser than ¼ in. and finer than 3½ in., resulting from the same causes. However, some authorities consider the upper size limit for gravel as 6 in. or more.

Both may be composed of materials in which a single mineral predominates, or of a mixture of many minerals, depending upon the composition of the original rocks. Residual deposits and glacial drifts often contain appreciable quantities of the relatively softer materials, such as limestone and feldspar. By far the larger proportion of gravels, however, is composed of the harder or more resistant minerals, such as quartz and various silicates, while sands as a rule are predominant silica, represented by quartz particles.

Residual sand and gravel particles are sharp-edged or angular, whereas transported gravels and sands consist of subangular to well-rounded or water-worn particles. Glacial gravels may be angular or rounded, and individual particles may show abrasion scratches. Color varies due to the mineral ingredients. Loose, dry sand ranges in weight from 90 to 110 lb. per cu. ft., and loose, dry gravel from 90 to 107 lb. per cu. ft.

Geology

Roughly, sand and gravel deposits may be classified in four groups with reference to their method of formation, as follows: (1) Residual, (2) fluvial, (3) marine and lake, (4) glacial.

Residual deposits are commonly unstratified, heterogeneous mixtures of boulders, pebbles, sand, and clay. They may contain much softer or inferior material, which through prolonged weathering has become porous and weak in structure. The particles may be angular or rounded but usually have rough or granular surfaces. Residual deposits commonly form a rock mantle over the parent formation and are formed by the weathering, in place, of the parent or superimposed formations. Ordinarily they are so intermixed with clay and inferior particles as to have minor commercial importance.

Sand and gravel picked up, transported and deposited by stream action form fluvial deposits. Such deposits may be imperfectly stratified, and frequently show size gradation. Coarse sand and gravel may be interspersed with lenses of fine sand or clay. The long axis of fluvial deposits parallels the direction of the stream flow. The beds usually vary greatly

Table 1.—Sand and gravel sold or used by commercial and Government-and-contractor producers in the United States in 1950, by States

State		Short tons		Value
Alabama		3,616,363		$ 2,463,722
Alaska		3,050,020		2,377,407
Arizona		2,498,777		1,590,001
Arkansas		4,118,080		3,446,578
California		41,894,039		35,547,558
Colorado		5,154,287		3,940,439
Connecticut		2,998,424		1,861,741
Delaware		367,524		291,715
Florida		2,793,865		2,806,431
Georgia	1/	1,211,782	1/	936,726
Idaho		4,281,908		3,043,905
Illinois		18,695,433		16,531,797
Indiana		9,723,033		7,516,509
Iowa		8,994,822		4,795,835
Kansas		9,781,123		6,782,285
Kentucky		2,382,672		2,262,964
Louisiana		5,505,362		6,310,425
Maine		4,897,143		1,726,217
Maryland	1/	5,864,472	1/	7,789,764
Massachusetts		7,111,067		5,430,790
Michigan		24,556,911		16,699,203
Minnesota		15,472,815		5,903,025
Mississippi		2,764,444		1,985,908
Missouri		6,232,411		5,267,939
Montana		9,044,125		5,140,207
Nebraska		5,077,792		3,167,659
Nevada		2,617,052		2,253,258
New Hampshire	1/	1,713,284	1/	$ 226,424
New Jersey	1/	7,620,422	1/	8,636,141
New Mexico		937,653		923,270
New York		21,778,089		18,075,237
North Carolina		8,352,475		5,465,067
North Dakota		4,270,838		1,660,371
Ohio		15,664,175		16,209,267
Oklahoma		3,286,834		2,356,853
Oregon		8,199,900		8,168,293
Pennsylvania		13,858,154		17,172,215
Puerto Rico		101,013		103,806
Rhode Island		579,528		580,322
South Carolina		348,060		166,710
South Dakota		5,392,247		2,750,847
Tennessee		4,152,084		4,411,105
Texas		17,972,105		15,707,724
Utah		3,435,277		2,251,515
Vermont		1,040,977		661,994
Virginia		4,373,984		4,144,846
Washington		10,605,791		7,435,340
West Virginia		3,613,046		6,241,057
Wisconsin		19,117,115		11,959,012
Wyoming		1,937,943		1,251,220
Undistributed	1/	1,398,000		612,000
Total		370,455,000		$295,040,000

1/ Output of commercial producers in New Hampshire and of Government-and-contractor operations in Georgia, Maryland, and New Jersey comprises "Undistributed."

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Table 2.—Comparison of number and production of commercial sand and gravel plants in the United States, 1949-50, by size groups 1/

Size groups, in short tons	1949				1950			
	Plants 2/		Production		Plants 2/		Production	
	Number	Percent of total	Short tons	Percent of total	Number	Percent of total	Short tons	Percent of total
Less than 25,000	953	38.8	9,320,000	4.1	890	35.6	8,952,000	3.6
25,000 to less than 50,000	425	17.3	15,344,000	6.8	478	19.1	17,242,000	6.8
50,000 to less than 100,000	449	18.3	32,019,000	14.2	439	17.6	31,058,000	12.3
100,000 to less than 200,000	337	13.7	47,223,000	21.0	367	14.7	51,733,000	20.5
200,000 to less than 300,000	146	5.9	35,576,000	15.8	147	5.9	35,676,000	14.1
300,000 to less than 400,000	53	2.2	18,147,000	8.0	73	2.9	24,999,000	9.9
400,000 to less than 500,000	38	1.5	16,983,000	7.5	31	1.2	13,933,000	5.5
500,000 to less than 600,000	16	.7	8,703,000	3.9	22	.9	12,147,000	4.8
600,000 to less than 700,000	6	.2	3,848,000	1.7	14	.6	8,745,000	3.5
700,000 to less than 800,000	11	.4	8,310,000	3.7	6	.2	4,388,000	1.7
800,000 to less than 900,000	7	.3	5,906,000	2.6	4	.1	3,386,000	1.4
900,000 to less than 1,000,000	3	.1	2,881,000	1.3	7	.3	6,775,000	2.7
1,000,000 and over	14	.6	21,204,000	9.4	22	.9	33,347,000	13.2
Total	2,458	100.0	225,464,000	100.0	2,500	100.0	252,381,000	100.0

1/ Excludes operations by or for states, counties, municipalities, and federal government agencies as follows—1949: 807 with an output of 87,899,000 tons of sand and gravel; 1950: 835 operations, 112,899,000 tons. Excludes operations by or for railroads as follows—1949: 128 with an output of 5,741,000 tons of sand and gravel; 1950: 142 operations, 5,175,000 tons.

2/ Includes a few companies operating more than 1 plant but not submitting separate returns for individual plants.

in thickness and may be complex in composition. As a rule, particles are poorly sorted and may be angular or rounded, depending on hardness and distance transported. When rounded, the surfaces are typically smooth.

Fluvial deposits occur in a variety of structural forms and usually overlie an eroded rock floor but may occur above finer materials. Present rivers are constantly constructing, tearing down, and reworking bars within their banks. During periods of high water, rivers leave their banks and extend over wide flood plains, leaving considerable material behind as they recede. At their mouths they deposit their loads in delta formations. Swift mountain streams emerging from narrow canyons or gorges onto broad, flat plains deposit their material in alluvial fans or cones. Old streams in wide valleys leave terraces behind as they cut their way down to lower levels. All are typical fluvial deposits.

Marine and lake deposits frequently consist of well-sorted materials with coarse and fine particles segregated. The long axis of various segregations usually parallels the shore line. Individual particles of marine sands range from angular to well rounded, while pebbles are usually well rounded and smooth. Marine deposits ordinarily consist of hard, tough materials received from streams and reworked by wave, tidal and marine-current action. Occasionally pebbles of limestone of organic origin, such as corals, may be present. Sand and gravel collected in lake beds present structures similar to marine deposits, except that the materials are not usually so well sorted and cleaned, and they also are less apt to be well rounded.

Glacial deposits are confined to areas that have been covered by the great ice sheets of the past. The ice, originating about Hudson Bay where igneous rocks predominate, brought down huge quantities of boulders, from which were formed the sand and gravel of igneous origin now scattered over much of the northern United States. The ice also scoured out valleys in sedimentary rocks enroute and carried along vast quantities of this material. Therefore, glacial materials are composed of a mixture of hard and soft rocks.

Most deposits of sand and gravel present evidence of more than one formational agency.

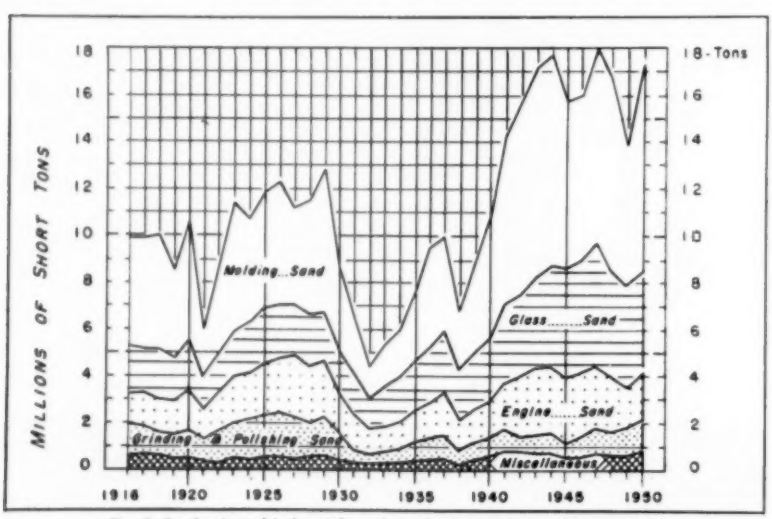


Fig. 3: Production of industrial sands in the United States, 1916 to 1950

Mining

The mining of sand and gravel is essentially an earth-moving industry, using all the equipment associated with projects involving the removal of obstructing hills or mountains or the filling of valleys to provide level surfaces for airports or city construction. The analogy may be carried farther by reference to the removal of underwater material in the excavation of ship channels in rivers and lake and marine bars. In fact, there is even a more direct comparison to alluvial gold mining from river bars by ladder dredges.

The great variety of deposits necessitates an equal variety of mining machinery. Dry-land operations employ power shovels, draglines, crawler-tread-mounted cranes, slackline cableways, cable-drawn power scrapers, motorized self-loading tractor scrapers, and bulldozers. Excavation may be from the bottom of the pit, as with power shovels and motorized scrapers, or from the bank, as with draglines, cableways and cranes.

Where the water table is close to the surface, mining may be by shovel to the water and then by some other unit below that elevation; by dragline, power scraper or slackline cableway from the surface to the desired underwater depth; or by hydraulic, ladder or dipper dredges. In addition, many varied combinations of equipment may be and are used.

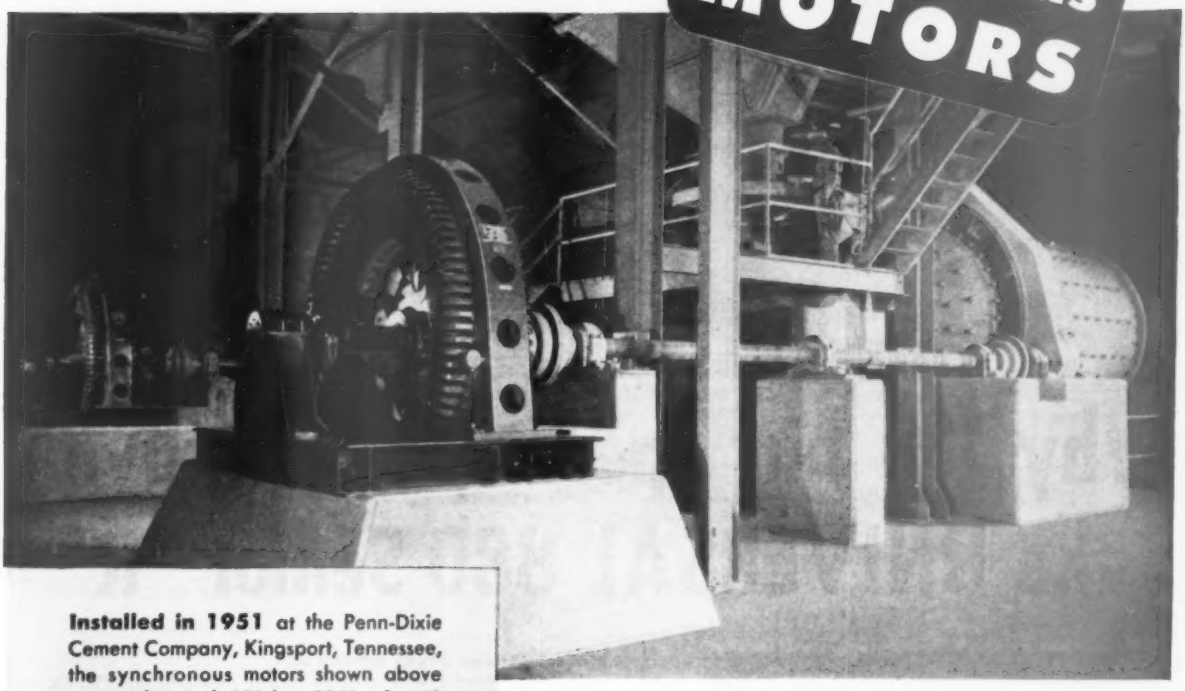
Haulage from pit to treatment plant is as varied as is the excavating equipment. Dry pits utilize motor trucks, carryall excavators, bulldozers and belt conveyors. The last may be permanent installations or portable to follow shovels or other excavators or combinations of portable and permanent.

In wet pits the dragline itself trans-

(Continued on page 111)

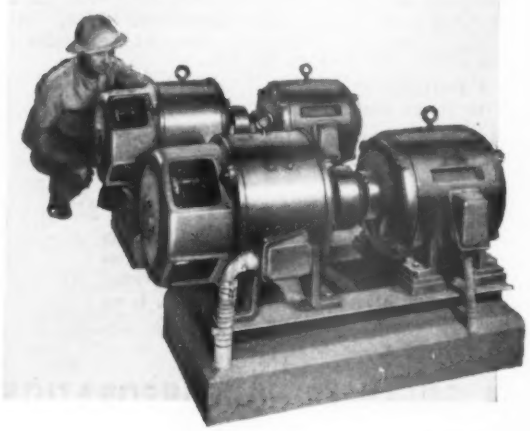
Built for a Long Grind

ALLIS-CHALMERS
Synchronous MOTORS



Installed in 1951 at the Penn-Dixie Cement Company, Kingsport, Tennessee, the synchronous motors shown above are each rated 350 hp, 80% pf, 440 volts, 180 rpm.

The 8 by 12-ft ball mill preliminators were furnished by Allis-Chalmers, along with the 15-kw m-g sets (shown below) which supply the excitation for the grinding mill motors.



Here are three reasons why Allis-Chalmers grinding mill motors help keep your mills grinding economically year after year:

Each motor is engineered for its job. A-C's half century of experience building electrical equipment *and* processing machinery assures torque and other operating characteristics tailored to the individual installation requirements.

Time-proved basic design features contribute to long life and trouble-free operation. These are described in detail in Bulletin 05B7648.

Adequate manufacturing, inspection and testing facilities insure that each motor will be built exactly as specified.

For more information on motors that minimize maintenance and down time, call in your A-C representative, or write for illustrated Bulletin 05B7648. Allis-Chalmers, Milwaukee 1, Wisconsin. A-4088

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Why the big operators are buying the UNIVERSAL 880 Senior "R"

No other gravel crushing plant in its weight class can challenge the Senior "R"'s output.

1. **More Tonnage From Screen —** 4' x 12' screen with full 48 square feet of screening area **plus** inclined mounting gives 25% or more output.
2. **Top Primary Output —** Universal 1036 overhead eccentric force feed jaw crusher. The top producing jaw on the market.
3. **Maximum Secondary Production —** 30" x 24" roll crusher. The largest offered in a plant of this weight. Feed design uses the full 24" width of the roll shells.
4. **Big 30" Conveyors —** You need extra wide conveyors to handle the Senior "R"'s high output . . . and you get them! Channel frame design for ruggedness — not formed frames.
5. **All This In A Portable Plant —** designed to meet state highway weight restrictions.
6. **Low Initial Cost —** Low maintenance.

NO OTHER PLANT HAS ALL THESE FEATURES

These are but a few of the reasons why the big operators, who keep a careful check on operating costs and production records, buy the Senior "R". Compare it feature for feature with other plants and prove this to yourself . . . UNIVERSAL'S THE BUY! For complete information see your nearest Universal distributor, or write to Universal Engineering Corporation, 327 8th Street N.W., Cedar Rapids, Iowa.

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ports the excavated material to dry land, depositing it in the washing plant, a transfer bin, or trucks. The power scraper and slackline cableway also convey from wet pit to shore with delivery similar to the dragline, or one cableway may deliver to another that takes material to the washer. Dredges, depending on their type, deliver to towboats and barges, pipelines, or washing plants built integral with the dredge hull.

Some dredges are designed and built for excavating from lake or ocean bars, washing and screening the product and then carrying the cargo to a shore point and unloading themselves to shore yards or further processing plant.

From the above it can be seen that the mining of sand and gravel is a wide-flung, versatile business, involving all types of dry-land and marine excavation methods. There probably is no other mineral product that utilizes a wider variety of mining methods.

Milling

In the early days of sand and gravel mining the majority of the material was marketed as "bank run" without any further processing. However, with the advent of portland cement, requirements became progressively more severe for clean-washed products, having a minimum of impurities, and sized to strict specifications either in single sizes with top and bottom limits or in various combinations of sizes, each with its top and

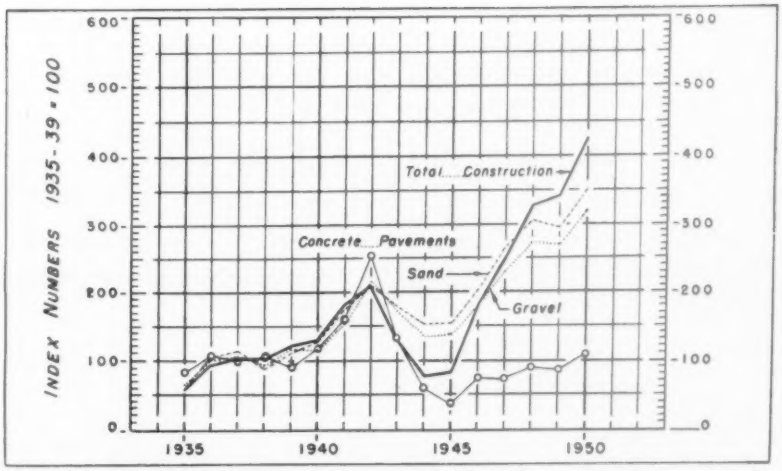

Fig. 4: Value of sand and gravel production compared with total construction (contract awards, value) and concrete pavements (contract awards, square yards) in the United States, 1935 to 1950. Data on construction and pavements are from Survey of Current Business

Table 3.—Sand and gravel sold or used by producers in the United States, 1949-50, by commercial and Government-and-contractor operations and by uses

	1949			1950		
	Short tons	Value		Short tons	Value	
COMMERICAL OPERATIONS		Total	Average		Total	Average
Sand:						
Glass	4,339,033	$ 10,772,151	$2.48	5,149,656	$ 12,815,511	$2.49
Molding	6,113,520	10,140,458	1.66	8,139,804	13,667,697	1.68
Building	59,307,353	47,879,130	.81	67,804,295	55,862,325	.82
Paving	31,520,407	25,849,473	.82	36,562,509	29,406,951	.80
Grinding and polishing 1/	1,080,886	2,063,866	1.91	1,299,760	2,670,791	2.05
Fire or furnace	318,373	429,512	1.35	372,890	522,875	1.40
Engine	1,883,580	1,830,549	.97	1,999,176	2,001,707	1.00
Filter	189,243	376,596	1.99	277,134	533,312	1.92
Railroad ballast 2/	955,996	407,234	.43	901,580	424,457	.47
Other 3/	2,300,240	1,961,224	.85	2,475,129	2,444,528	.99
Total commercial sand	108,008,631	$101,710,193	$ .94	124,981,933	$120,350,154	$ .96
Gravel:						
Building	49,788,200	49,319,528	.99	57,093,484	57,587,369	1.01
Paving	60,571,091	52,972,235	.87	62,755,788	55,834,416	.89
Railroad ballast 4/	10,444,070	5,618,124	.54	9,451,187	5,249,241	.56
Other 5/	2,393,486	1,716,039	.72	3,274,239	2,303,464	.70
Total commercial gravel	123,196,847	109,625,926	.89	132,574,698	120,974,490	.91
Total commercial sand and gravel	231,205,478	211,336,119	.91	257,556,631	241,324,644	.94
GOVT.-AND-CONTRACTOR OPERATIONS 6/						
Sand:						
Building	1,604,000	959,000	.60	2,759,000	1,675,000	.61
Paving	7,424,000	2,820,000	.38	11,159,000	4,286,000	.38
Total Government-and-contractor sand	9,028,000	3,779,000	.42	13,918,000	5,961,000	.43
Gravel:						
Building	3,133,000	2,235,000	.71	5,216,000	4,510,000	.86
Paving	75,738,000	31,093,000	.41	93,765,000	43,245,000	.46
Total Government-and-contractor gravel	78,871,000	33,328,000	.42	98,981,000	47,755,000	.48
Total Government-and-contractor sand and gravel	87,899,000	37,107,000	.42	112,899,000	53,716,000	.48
COMMERCIAL AND GOVERNMENT AND-CONTRACTOR OPERATIONS						
Sand	117,036,000	105,489,000	.90	138,900,000	126,311,000	.91
Gravel	202,068,000	142,954,000	.71	231,555,000	168,729,000	.73
Grand total	319,104,000	$248,443,000	$ .78	370,455,000	$295,040,000	$ .80

1/ Includes blast sand as follows—1949: 393,427 tons valued at $1,222,513; 1950: 470,717 tons, $1,463,623.
2/ Includes ballast sand produced by railroads for their own use as follows—1949: 169,219 tons valued at $13,748; 1950: 188,470 tons, $35,790.
3/ Includes some sand used by railroads for fills and similar purposes as follows—1949: 406,344 tons valued at $101,177; 1950: 198,616 tons, $59,992.
4/ Includes ballast gravel produced by railroads for their own use as follows—1949: 4,406,251 tons valued at $1,748,602; 1950: 3,959,670 tons, $1,361,734.
5/ Includes some gravel used by railroads for fills and similar purposes as follows—1949: 759,841 tons valued at $240,217; 1950: 828,723 tons, $184,105.
6/ Approximate figures for states, counties, municipalities, and other Government agencies directly or under lease.

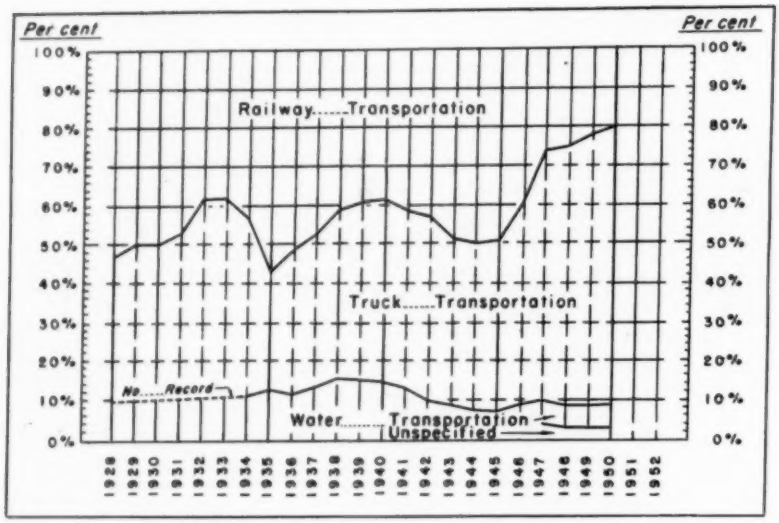

Fig. 5: Method of movement from deposit to market

bottom limits and the whole within rather strict fineness modulus limits.

To meet these requirements, the sand and gravel producer has had to become a mineral dresser of no mean magnitude, employing practically all the tools and equipment of the ore-dressing engineer on a large scale. These include bucket elevators, screw and belt conveyors, trommel and log washers, trommel and vibrating screens, crushers of all types, jigs, tables, classifiers, dewaterers, settling basins, stockpiling and recovery systems, pumps and pipe-lines, aerial trams, heavy-medium separators, and a host of minor tools.

Byproducts

The gravels themselves do not ordinarily afford much in the way of byproducts. However, some deposits do afford opportunity for separating out pebbles suitable for ball-mill grinding of ores with which iron or steel balls cannot be used.

Sand, on the other hand, affords the opportunity for segregating several byproducts (or coproducts), such as molding sand, glass sand, engine sand, and grinding and polishing sands.

In addition, a number of plants have installed equipment for recovering gold as well as the heavy "black" sands containing ilmenite, rutile, monazite, columbite, tantalite, zircon, and other such rare constituents, which formerly stayed in the bulk product or went to waste piles. More and more attention is being paid to recovery of these byproduct minerals.

Substitutes

Crushed stone and crushed slag are highly competitive for gravel. Pumice is frequently used for coarse aggregate where lightweight or high temperature is a requisite.

Crushed stone or slag properly ground and sized is becoming increasingly important as a source of sand. In fact, some specifications require stone crushed to sand sizes in place of sand. Limestone, granite, chert and sandstone have been used for this purpose.

In areas where sand is plentiful and gravel scarce, a substitute coarse aggregate has been successfully prepared from calcined clay or shale. Where light weight is a requisite, a rather wide choice of expanded materials is available for both coarse and fine aggregate.

Tailings from ore-milling operations

Table 4.—Sand and gravel imported for consumption in the United States, 1940-49, by classes

Year	Sand				Gravel		Total	
	Glass sand 1/		Other sand 2/					
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1940	4,337	$ 8,722	264,170	$ 90,350	175,558	$ 25,686	444,065	$124,758
1941			263,389	105,088	164,175	26,132	427,564	131,220
1942	3/	5	408,825	297,122	146,116	60,389	554,941	357,516
1943	18	363	296,262	206,145	86,924	63,381	383,204	269,889
1944	15	181	209,255	129,632	67,929	31,208	277,199	161,021
1945	3/	148	200,280	126,102	80,861	43,976	281,141	170,226
1946	5,006	9,102	4/ 262,484	4/ 194,820	83,860	25,847	4/ 351,350	4/ 229,769
1947	7,804	12,532	297,481	283,884	177,244	100,665	482,529	397,081
1948	16,914	24,134	4/ 336,898	4/ 302,117	89,174	30,411	4/ 442,986	4/ 356,662
1949	11,491	20,152	287,452	283,066	135,227	19,194	434,170	322,412

1/ Classification reads: "Sand containing 95 percent or more silica and not more than 0.6 percent oxide of iron and suitable for manufacture of glass."
2/ Classification reads: 1940-47: "Sand, N. S. P. F."; 1948-49: "Sand, N. S. P. F., crude or manufactured."
3/ Less than 1 ton.
4/ Revised figure.

Table 5.—Number and production from commercial sand and gravel plants by size groups, 1931 and 1950

Size group, short tons annual	1931						1950					
	Plants			Production thousand tons			Plants			Production thousand tons		
	Number	Percent	Cum. percent	Tons	Percent	Cum. percent	Number	Percent	Cum. percent	Tons	Percent	Cum. percent
Less than 25,000	1,277	59.1	59.1	9,518	7.4	7.4	890	35.6	35.6	8,952	3.6	3.6
25,000-49,999	295	13.6	72.7	10,875	8.5	15.9	478	19.1	54.7	17,242	6.8	10.4
50,000-99,999	297	13.7	86.4	20,969	16.4	32.3	439	17.6	72.3	31,058	12.3	22.7
100,000-199,999	166	7.7	94.1	23,939	18.7	51.0	367	14.7	87.0	51,733	20.5	43.2
200,000-299,999	49	2.3	96.4	12,009	9.4	60.4	147	5.9	92.9	35,676	14.1	57.3
300,000-399,999	24	1.1	97.5	8,130	6.3	66.7	73	2.9	95.8	24,999	9.9	67.2
400,000-499,999	16	.7	98.2	7,302	5.7	72.4	31	1.2	97.0	13,933	5.5	72.7
500,000-599,999	11	.5	98.7	5,865	4.6	77.0	22	.9	97.9	12,147	4.8	77.5
600,000-699,999	4	.2	98.9	2,649	2.1	79.1	14	.6	98.5	8,745	3.5	81.0
700,000-799,999	5	.3	99.2	3,795	2.9	82.0	6	.2	98.7	4,388	1.7	82.7
800,000 and over	17	.8	100	23,035	18.0	100	33	1.3	100	43,508	17.3	100
	2,161	100		128,086			2,500	100		252,381		

and slag from smelters are frequent sources of both coarse and fine aggregate. A number of large metal producers process waste tailings for lucrative sale in the aggregates market.

Reserves

United States reserves of sand and gravel may be quite properly termed nearly limitless. However, the markets for sand and gravel are limited to areas that they can reach in competition with other materials. This involves the expense of transportation from plant to point of use. Markets are limited also to areas of construction.

Sand and gravel deposits within short transportation distance of large construction areas are becoming depleted. River and lake bars contiguous to construction areas are also becoming increasingly contaminated. This results from working and reworking the same bars. Not all the suitable material is extracted during the first operation. The waste returned to the water accumulates and becomes a larger percentage of the material to be worked on the second pass.

Widespread Uses

The principal use for sand and gravel is as fine and coarse aggregate for concrete for construction of buildings, bridges, dams, and similar structures, and for fine and coarse aggregate for cement and bituminous mixes for road, highway and airport construction. Large quantities are used without admixtures for subgrade or bases for highways and airports. Significant quantities are used also for township and county secondary or tertiary roads, with or without admixtures.

Metal industries consume millions of tons annually as molding sands. Similar but smaller tonnages are consumed in making glass of all types. Locomotives use large quantities to increase brake friction on slippery or wet rails. Municipalities require large quantities for water filters in purifying city water supplies. Smaller quantities of special types of sands are consumed in sand blasting and in grinding and polishing other materials.

Production, Consumption, and Foreign Trade

Figs. 1, 2, and 3 and Tables 1, 2, and 3 give a good picture of the production of sand and gravel.

Fig. 4 shows graphically the index curves for value of sand and gravel production individually and, for comparison, the curve for the United States total construction and that for concrete pavements. The similarity between the curves for sand and gravel production and total construction is quite apparent.

There is no recorded export of sand and gravel. Sand is imported primarily for special purposes, and gravel imports probably represent

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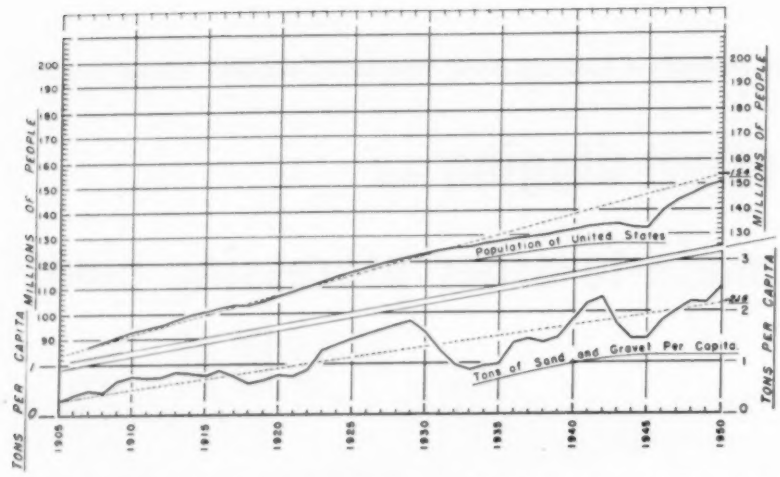


Fig. 6: Comparison of the growth of population in the United States with the growth of use of sand and gravel per capita

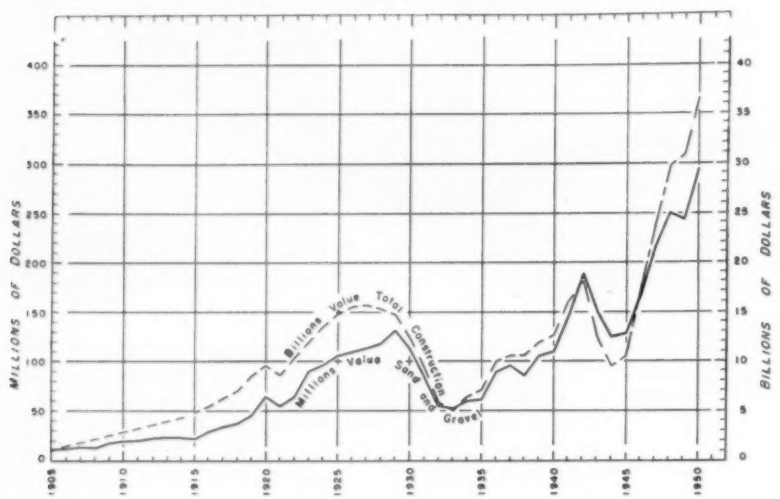


Fig. 7: Comparison of the value of sand and gravel produced (millions of dollars) with the value of national construction (billions of dollars)

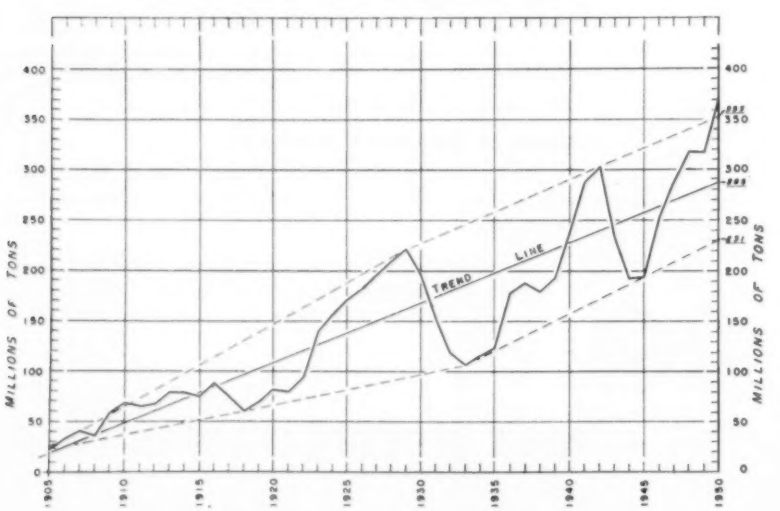


Fig. 8: Production of sand and gravel, 1905 to 1950

short hauls across the border from Canada. Table 4 gives the imports since 1940.

The hills and valleys of the production curve for sand and gravel will be found to parallel closely those for the construction industry. Since construction is vital to the Defense Program, it follows that the production of sand and gravel is of equal importance.

Prices and Costs

The values of the various grades of sand and gravel, as listed in Table 3, are computed as the value at the producer's plant. The price the consumer must pay will depend upon the cost of transportation from plant to consumer and the proportion of such delivery expense that the producer is willing to absorb to meet competition or to keep his plant running during a slack period. For these reasons, selling prices may have only casual relationship to values at the plant. Keeping this relationship between prices and plant values in mind, it is of interest to note that the latter have increased from about 40 cents a ton in 1905 to 77 cents in 1950, as computed from Fig. 1. This means an increase in 45 years of less than 100 percent—somewhat below the increase for most other manufactured products during the same period. The reason for this probably lies in the fact that during that 45-year period the sand and gravel industry has emerged from a manual operation to a highly mechanized one.

Sand and gravel are low-valued materials. As such they cannot tolerate the relatively high cost of transportation over long distances. As a result, markets must be found within economic shipping distance. Costs at individual plants depend upon many variables; such as the efficiency of management, the cleanliness of the natural product, the suitability of the natural bank-run ratio of sand to gravel for the market supplied, the type of mechanization used and its efficiency with respect to the deposit, the degree and expense of processing required to meet market specifications, and the sales ability of the producer. The margin of profit will vary with all of these factors, but the overall average margin for all producers is small and probably not over 10 to 15 percent of the plant values as computed from the graph in Fig. 1.

Fig. 5 shows the percentage of the total production of sand and gravel moved by various modes of transport.

It is of interest to note that as late as 1936 the railroads handled 51.3 percent of the sand and gravel shipments, trucks 37 percent, and waterways 11.7 percent. Comparing these figures with those for 1950 in the figure shows the increasing trend to truck transport. This trend further emphasizes the market limitation (short haul) for sand and gravel producers.

Conservation

Until recently there has been little if any need for conservation in this industry with respect to natural reserves. The supply has been adequate, with the possible exception of those deposits near large cities.

In a sense conservation has been practiced by operators so located, in that they have procured portable plants and set them up on deposits in the field nearer to highway or other contracts that they would otherwise have supplied from their city plant. This might be construed as conservation of the city deposit for city markets.

Significant Trends

At present there does not appear to be any reason to doubt that the sand and gravel industry will continue to expand in the future in line with the expansion of total national construction. As deposits are depleted and competitive materials enter the market, the sand and gravel industry may encounter difficulties, but such conditions are expected to be local in character.

In 1927 the Minerals Yearbook presented the first table showing the number and production from plants in various size groups. A study of these annual tables from 1931 to 1950 shows some interesting trends. Table 5 shows the tabulations for 1931 and 1950 for direct comparison.

Plants shown in these tables are those designated as "commercial" or producing for sale. Plants operated by contractors, railroads, and municipalities are not included.

Between 1931 and 1950—

(1) The total number of commercial plants increased 15.7 percent.

(2) The total production from commercial plants increased 97.0 percent.

(3) The *average* production *per plant* increased 70.6 percent.

There has been a 20-year trend toward larger unit plants.

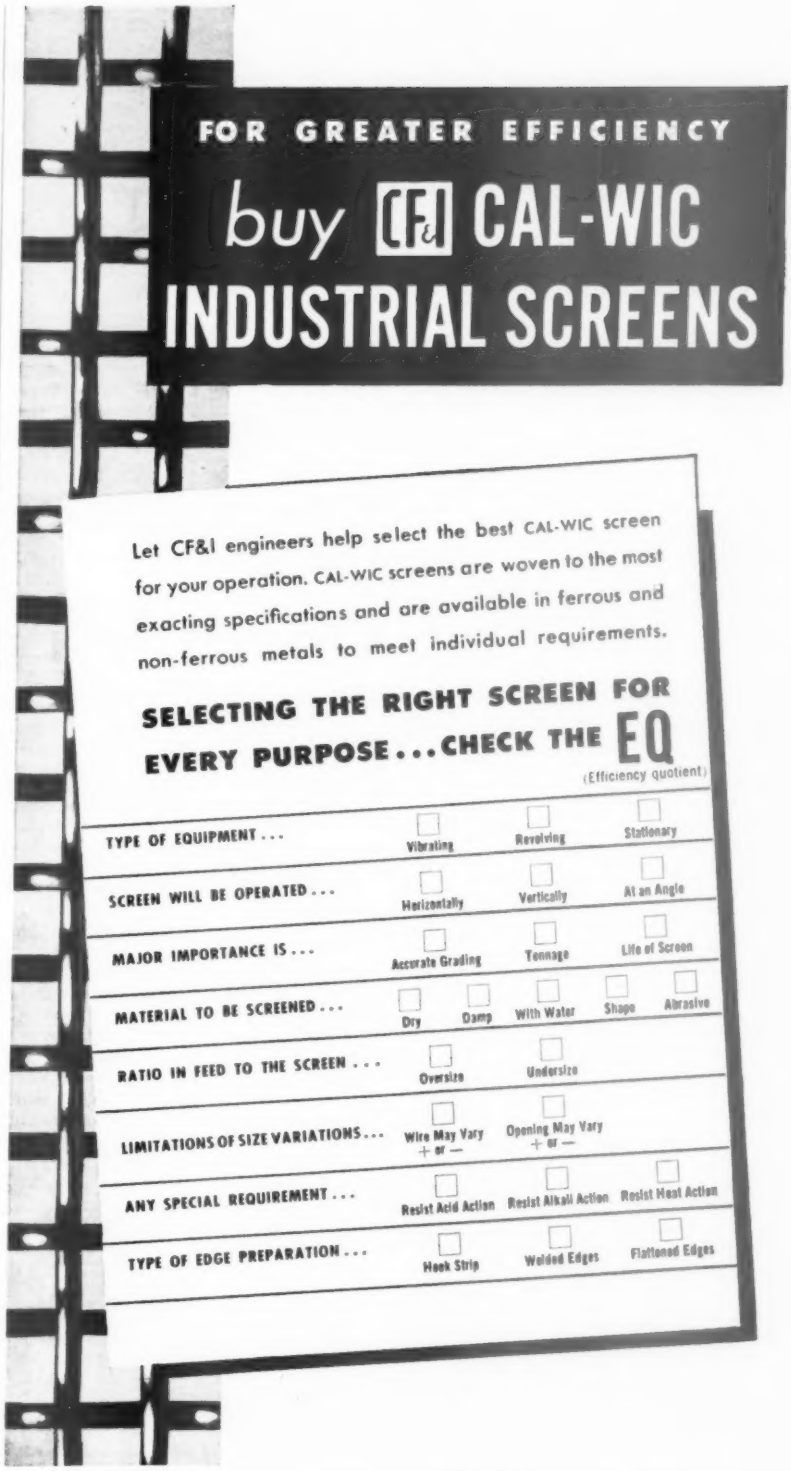
Table 5 shows that in 1931 and in 1950 two-thirds of the production came from plants producing less than 400,000 tons annually, but this group constituted 97.5 and 95.8 percent of the total plants. Conversely, roughly 40 percent of the production comes from 4 percent of the plants.

In the 4-percent group of larger plants, the average production *per plant* remained surprisingly constant (800,000 in 1931 and 780,000 in 1950) in spite of the increase from 53 to 106 plants, or 100 percent.

In the smaller size group (96 percent) the average production per plant increased from 40,000 tons in 1931 to 71,000 tons in 1950, with an increase in number of plants from 2108 to 2394, or 13.5 percent.

The 20-year trend toward larger plants seems to have been accentuated in those plants producing less than 400,000 tons annually.

The figures in Table 6 have been computed to determine where the trends affect the various group sizes.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RATIO IN FEED TO THE SCREEN... Oversize Undersize
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Table 6.—Trends in number and size of plants, 1931-1950

Size group short tons annual	Number of plants			Production		
	1931	1950	Change, percent	1931 Thousand tons	1950 Thousand tons	Change, percent
Less than 25,000	1,277	890	— 37.7	9,518	8,952	— 5.9
25,000-49,999	295	478	+ 62.0	10,875	17,242	+ 58.6
50,000-99,999	297	439	+ 47.8	20,969	31,058	+ 48.1
100,000-199,999	166	367	+121.0	23,939	51,733	+116.0
200,000-299,999	49	147	+200.0	12,009	35,676	+195.7
300,000-399,999	24	73	+204.0	8,130	24,999	+207.5
400,000-499,999	16	31	+ 93.8	7,302	13,933	+ 90.8
500,000-599,999	11	22	+100.0	5,865	12,147	+107.0
600,000-699,999	4	14	+250.0	2,649	8,745	+230.0
700,000-799,999	5	6	+ 20.0	3,795	4,388	+ 15.6
800,000 and over	17	33	+ 94.1	23,035	43,508	+ 88.6
	2,161	2,500	+ 15.7	128,086	252,381	+ 97.0

From Table 6 it is noted that the group showing greatest percentage increase in number of plants and tons produced is that from 600,000 to 700,000. However, reference to Table 5 shows that this group represented less than 1 percent of the plants and only 3.5 percent of the total tonnage.

The greatest increase appears to be in the four groups ranging from 100,000 to 500,000 tons annually. Again referring to Table 5, these four groups comprise roughly 25 percent of the plants and produced 50 percent of the tonnage in 1950.

It appears from this that the trend as to plant size is to those producing 600 to 2400 tons daily (based on 175-day year).

With depletion of deposits, encroachment of residential areas, and increasing stringency of specifications, the operator of the metropolitan plant has had to consider more adequate and accurate exploration for new deposits. In the course of this study he has shown an increasing interest in the use of standard tools for exploration of new deposits as well as the design of new and better tools.

Fig. 6 shows graphically the increased population of continental United States, a curve showing the growth in per capita use of sand and gravel and a calculated trend line.

Fig. 7 presents curves showing the value of total construction in the United States (from U. S. Department of Commerce) and the value of sand and gravel produced (from Bureau of Mines Minerals Yearbook). The parallelism of the two curves is apparent.

Fig. 8 presents a curve and trend line for sand and gravel production within an indicated envelope of peaks and valleys. (See page 114)

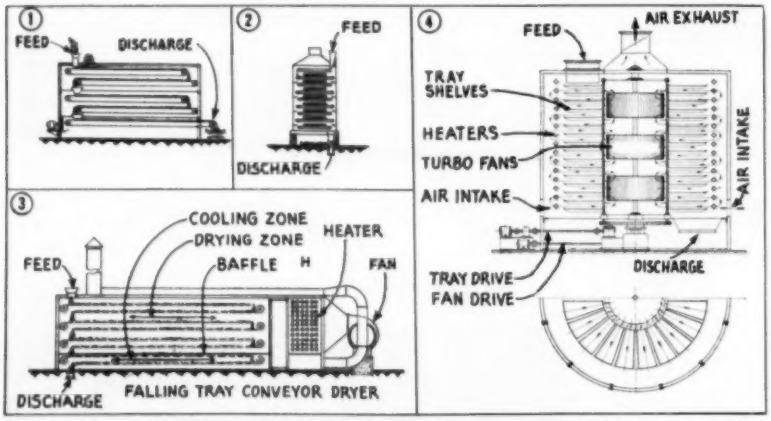
Efficient Operation of Dryers

By LEO WALTER*

CONTINUOUS MULTI-BAND CONVEYOR DRYERS or tunnel kilns consist of a tunnel through which pass several conveyors, or a single band in several layers. Gravity is used to move the stock from one band to the next (Fig. 1), until discharge takes place at the opposite lower end. In the vertical type band dryer (Fig. 2) the conveyors are placed in a tower, and the material falls downward. Usually the hot air is admitted through a single point of inlet, either in concurrent, or in counterflow. Short circuiting of air sometimes takes place, and reconstruction in the form of providing two or more separate hot air inlets might improve output. Zonal recirculation, although desirable, is usually impracticable, but insertion of baffles might improve air and heat distribution.

*Consulting engineer, Cheltenham, England

Fig. 3 illustrates a falling tray conveyor dryer with a drying and a cooling zone, both separated by a baffle plate. For certain chemicals continuous-type dryers were designed, consisting of a tower with shelves. Scraper bars rotate and make the material drop from tray to tray, or the whole tower rotates, against stationary scrapers. Fig. 4 illustrates a type with turbo-fans and heater steam coils around. An improvement of the latter would consist in sectionalizing the steam coil, thus providing better steam trapping with improved heat transfer. The wider use of glass windows and of sampling openings in the tower is also advisable. Of greatest importance is to watch that the material is continuously agitated. Sometimes a better scraper shape might assist in better drying. Exchangeable scrapers for different types of material would also be an advantage.



Band and tray types of dryer. Fig. 1: Multiple band type. Fig. 2: Vertical band type. Fig. 3: Falling tray convector type. Fig. 4: Continuous tray type

Rotary Dryers

Direct fired rotary dryers are used where the material can withstand vigorous movement and higher temperatures. Where the hot gases flow on the outside of the shell, increase of flow velocity by baffling can improve heat transfer. Obviously, thermal efficiency of solid-fuel fired dryers depend on the method of firing, on the choice of the correct type of fuel and on the composition of flue gases.

Instrumentation is often incomplete, and better combustion control for firing appliances such as automatic stokers, or gas or oil-fired furnaces with automatic burner control is highly advisable, but naturally costly. Fig. 5 illustrates a coal or coke fired counter-current type, and Fig. 6 a parallel flow type with gas or oil burner, used as a calciner. A combined calciner with cooler is shown in Fig. 7, using gas or fuel oil. (See page 118)

It should be noted that in recent years the designs of gas or oil burners have been greatly improved, and replacement of an outdated burner by a modern design gives a good opportunity to increase thermal efficiency. Where producer gas is used, as in Fig. 8, which shows a double shell type, correct operation of the gas producer is essential. Sometimes the paddles or shelves of a dryer have not the right shape, and improvements should be made to speed up, or to retard the longitudinal spiral movements, as the case may be. Alteration

of the inclination of the axis of the drum also adjusts speed of movement of material. Installation of a dust separator at the air discharge will avoid air entrainment. In those dryers where the gases flow along the outer shell, the radiation effect of the hot gases is important. For static shell types the heat transfer is mainly by conduction. The more intimate the contact is between heating surface and material, the better the drying rate. (See page 118 for Figs. 5 to 12)

In certain cases recirculation of hot gases for direct heated rotary dryers (Fig. 9) can be added to existing dryers during reconstruction. For those materials where direct contact with combustion gases is not permissible, steam heating is applied. (Figs. 10 and 11). Counter-current flow and a suction type with cyclone are employed in Fig. 10, with steam heater battery, at the discharge end. A pressure type with counter current is illustrated in Fig. 11. The simplest type has parallel flow whereby gases and material travel in the same direction. Much depends on correct adjustment of inclination, of speed of rotation, and of efficiency of the heater. Dry steam at constant supply pressure, correct steam trapping, and last but not least, suitable design of the fan and driving motor are factors to be carefully watched. Other indirect heating elements use electricity. It is, of course, possible to use platen or tube-type heat exchangers between gases of combustion and hot air, which latter is used to come into contact with the material. Wherever heat exchange comes into operation, utmost cleanliness of heat transfer surfaces has to be maintained. Frequent cleaning of outer and inner surfaces of heater tubes, or of platens etc., is imperative for dryer efficiency. The use of back-presure or of passout steam from steam engines or turbines is, of course, an excellent means for steam economy. High temperature hot water with pump circulation is another method of generating hot air, and heat losses from condensate do not occur here.

Efficiency of Spray Dryers

Modern types of spray dryers (Fig. 12) work very efficiently, because great progress has been made in design of reliable atomizers. Older types, however, lend themselves to reconstruction of the atomizing unit, of filters, and of air heaters. They are also sometimes inadequately instrumented, and modern temperature-humidity-and pressure recorders can be used with advantage. Thermal efficiency of spray dryers is less important than overall efficiency, but can be easier assessed. It requires long observation and great experience, together with repeated tests to obtain optimum output from a spray dryer at minimum cost. Sometimes an adjustment of the atomizing unit will produce a different size of globules with subsequent improved operation. Provided that the design of the atom-

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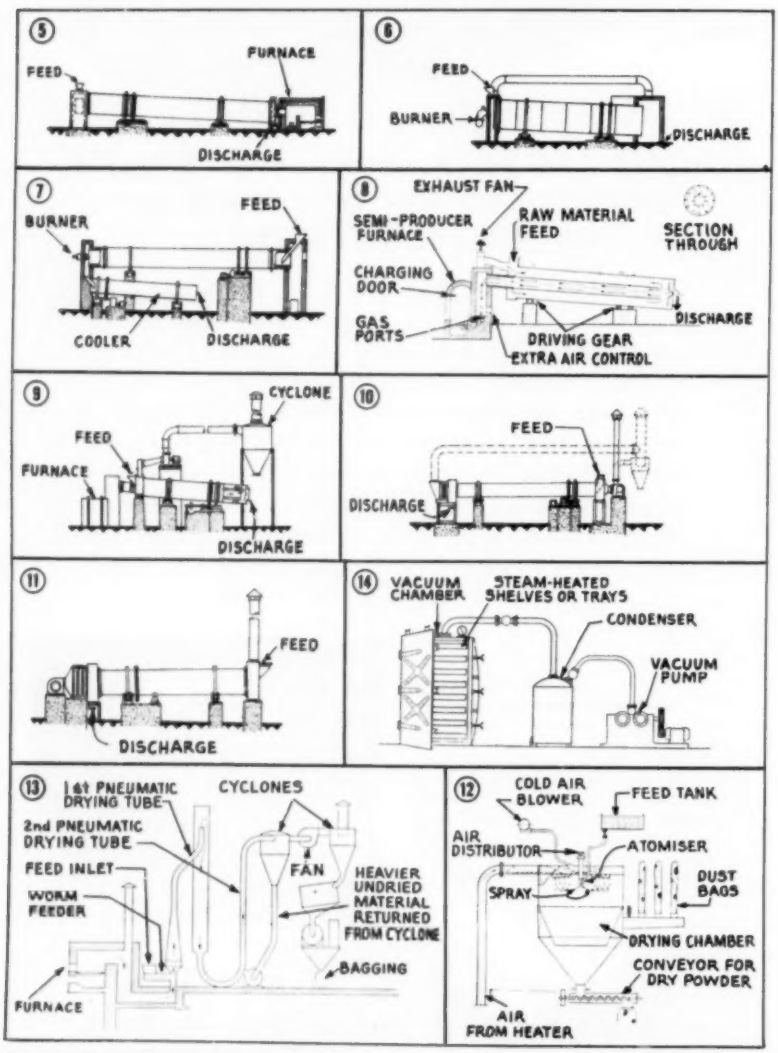
izing unit is efficient to prevent clogging or uneven atomization, reliable operation can be expected. Where the high pressure jet system causes the need for frequent nozzle cleaning with loss of production time, reconstruction and use of a revolving disc unit might improve matters, or the use of a nest of nozzles applying compressed air. The latter must be oil-free, clean from mechanical and other impurities.

Fig. 13 shows the layout of a pneumatic drying plant, keeping the particles in suspension during the drying process. What has been said about furnace and combustion efficiency for rotary kilns applies here just the same. Every care has to be taken that the wet material is properly entrained in the hot gas or air stream, and frequent sampling is highly advisable. Measurement of air velocities during the various phases of drying will help considerably to maintain dryer performance or to improve it, and easily cleanable pitot tube flow meters can be used to watch the flow volume. In case uneven drying occurs, something is wrong with keeping all globules of wet material in the gas stream, and closer investigations are required, starting from the combustion chamber, and ending at the cyclones and the bagging end. Excessive deposits in the cyclones indicate that the cyclone design is not up-to-date, or that cyclone surfaces have become rough. The question of air leakage is most important in pneumatic drying, but occasional tests with the soap solution and air bubble method will soon disclose escaping air. Fan and motor maintenance is another important point to be watched. Sometimes the means for adjusting gas velocity in relation to material characteristics are somehow inadequate when operation should cover different materials. Redesign of dampers, etc., might improve matters, and so does the use of an infinitely variable motor drive gear. Where frequent scorching occurs, the wet particles might vary too much in moisture content, and in shape. The preparation before feeding requires in such instances, greater care and attention.

The author expresses thanks to the Institute of Fuel, London, for permission to use certain drawings from a paper presented to the Institute Fuel, London, January 1951, and published in the Journal.



Rotary and special types of dryer. Fig. 5: Coal or coke-fired rotary, using counter current flow. Fig. 6: Gas or oil-fired rotary calciner with parallel flow. Fig. 7: Calciner with cooler. Fig. 8: Double-shell rotary. Fig. 9: Direct heated rotary with return of hot gases. Fig. 10: Counter current rotary with steam-air heater. Fig. 11: Pressure type rotary dryer with counter current flow. Fig. 12: Spray dryer. Fig. 13: Pneumatic dryer. Fig. 14: Vacuum dryer

Vacuum Drying

The difference in vapor pressure between the evaporated liquor and the drying space is increased in vacuum drying, in spite of low temperature difference.

(a) Heat required to vaporize moisture.

(b) Heat demand from hot air or gas.

(c) Heat demand from dryer structure, conveyor band, etc.

(d) Heat losses by radiation from external surfaces.

Space does not allow to give examples for dryer calculations, based on the use of the psychometric chart. What must be realized, however, by each user of a dryer is that no universal dryer exists which would handle a great diversity of products to be dried. Greatest care has, therefore, to be exercised when using a drying installation for a different material than that for which it has been designed. The writer has had repeated experience with dryers in operation, which have been bought as second-hand machinery, and have been installed to deal with a completely different material than that for which they have been originally used. It is here, where fuel, heat, power and labor can be wasted, and where overall dryer efficiency is very low. Replacement of such obsolete dryers by modern drying plants, designed for actual working conditions will be a sound capital investment.

Canadian Gypsum Products

CANADIAN SHIPMENTS of gypsum wallboard amounted to 15,610,839 sq. ft. in January, compared with January, 1953, shipments of 18,778,050 sq. ft. Shipments of gypsum lath in January, 1954, decreased to 18,401,981 sq. ft., from 18,983,440 sq. ft. reported for the same month of the previous year. January shipments of gypsum sheathing increased to 423,312 sq. ft. this year, from 293,784 sq. ft. in 1953. Shipments of gypsum plaster totaled 15,693 tons for the 1954 period, compared with 16,483 tons in 1953.

Brazil Cement Production

PRODUCTION OF CEMENT in Brazil's 15 producing plants totaled 1,466,374 tons during the first nine months of 1953. Eleven additional plants reportedly will be placed in operation by 1955 when production is expected to reach a total of 4,000,000 tons.

Secondary Drilling

(Continued from page 101)

Test No. 4

Location: Bryan Rock & Sand Company, Rolesville, N. C. Quarry, March 17, 1953

Conditions: Scattered boulders that had been set back of the shovel—spread of approximately 100 ft.

Type of Stone: Granite Gneiss—48 to 52 Los Angeles Rattler Test.

Operator: W. E. Johnson, Engineer—Only few hours operating time on this machine—approx. 10.

Hole	Depth Drilled Inches	Drill Time Seconds
1 9:10	21	44
2	23	47
3	26¼	50
4	16½	26
5	20½	36
6	29¼	65
7	22½	39
8	15	28
9	22¼	48
10*	17½	37
11	18	34
12	20	39
13	23½	44
14	21½	41
15	17	37
16	16¾	36
17	14	23
18**	16	36
19	28	52
20	13	22
21	15½	32
22	11	21
23	16	37
24	26½	57
25	25¼	63
26	25	61
27	17	36
28	17½	37
29 9:46	14½	32
Total	569½	1160

* Moved 40 ft.—Set up 3 min.
** Moved 75 ft.—Set up 3 min.

Summary

Size of Bit—1⅝—4-point

Total footage drilled	47.50 ft.
Total drill time	19 min. 33 sec.
Inches per minute	29.46 in.
Average depth	19.60 in.
Boulders drilled	29
Total time	36 min.

Avg. 1 boulder in less than 1.5 min.

Test No. 5

Test Location: Greystone Granite Quarries, Inc., Greystone, N. C. January 23, 1953

Conditions: Boulders set in back of shovel and boulders in muck pile.

Type of Stone: Granite Gneiss—37 to 38 Los Angeles Rattler Test.

Hole	Depth Inches	Drill Time Seconds	Moving Time Seconds
1	12	29	14
2	12	23	25
3	17	52	16
4	20	48	13
5	16	39	9
6	14	52	15
7	20	56	18
8	20	50	13
9	18	38	14
10*	16	40	105
11	14	37	17
12	16	35	20
13	14	40	14
14	24	63	30
15	32	76	29
16	26	56	17
17	12	27	14
18	14	30	20
19	18	42	21
20	32	60	55
21	22	57	45
22	18	43	27
23	14	35	15
24**	14	33	68
25	18	49	—***

* Moving to new location
** Moving to new location
*** End of 30 min. time test.

Summary

Size of Bit—1⅝—4 point

Total footage drilled	37 ft. 9 in.

(Continued on page 120)

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Total drill time	18 min. 30 sec.
Inches per min.	24.36 in.
Average depth	14.10 in.
Total boulders drilled	25
Total time	29 min. 4 sec.

Avg. 1 boulder in 1 min. 10 sec.

Test No. 6

Date: November 9, 1953

Location: Beverly Quarry, Campbell Limestone Co., Liberty, S. C.

Conditions: Boulders scattered over quarry.

Travel Drill Test: 1½-in. Carbide Chisel Bits	
Number boulders drilled	172
Total Time	8 hr.
Average depth	29.8 in.
Total footage	427.4 ft.
Average boulders per hour	21½
Average feet per hour	53.4
Another test Nov. 16, 1953	
Number boulders drilled	211
Total Time	8 hr.
Average depth	23.4 in.
Total footage	412 ft.
Average boulders per hour	26⅜
Average feet per hour	51.5

Rocky's Notes

(Continued from page 49)

research which often entails considerable risk.

The book contains 424 pages and is bound in limp covers so that it readily stays open to the desired page.

Thermo-Gravimetric Analysis

Another new textbook which makes an excellent supplement to the one we have just mentioned is "Inorganic Thermo-Gravimetric Analysis,"† by Clement Duval, Sorbonne, Paris. The publisher says that this is the first in what may be a revolutionary new field; it is based on Dr. Duval's development of automatic gravimetric analysis. With this new method, analyses can be performed without previous separation of the constituents, averaging 15-20 minutes per analysis and eliminating completely the personal error.

Dr. Duval is research director of the National Center for Scientific Research at the Sorbonne. He has divided the book into two sections: Modern aspects of thermo-gravimetry, including a historical review and a full description of automatic gravimetric analysis; and thermo-gravimetric investigation of analytical precipitates, his experimental records concerning the 967 precipitates proposed in the literature for inorganic gravimetric analysis.

For the uninitiated it may be explained that the term thermo-gravimetric analysis means following the gain or loss in weight of a heated body as a function of the temperature and of the time. Researchers in cement and concrete are familiar with this kind of laboratory investigation because it is very helpful in determining how water (or hydroxyl ions) occurs in such materials as set cement. When the graphs of unknown compounds are compared with those whose analyses have been accurately determined, a great deal can be learned without resort to more elaborate methods of chemical analysis. The de-

†Elsevier Press, 402 Lovett Boulevard, Houston, Tex., price $11.00.

vice described here, and the results obtained with it, should certainly prove of very great help in any research laboratory doing work on inorganic chemistry.

Labor Relations Trends

(Continued from page 55)

Employing Lathers' Association of Chicago and Vicinity, Local 74 of Wood, Wire and Metal Lathers' International Union, et al. The Supreme Court decision reversed a U. S. District Court decision that the unions involved were immune from prosecution (by virtue of Section 20 of the Clayton Act) for violation of the Sherman Anti-Trust Act.

Relevant parts of the Supreme Court decision are as follows: "The United States brought this civil action in a Federal District Court charging the defendants (appellees here) with having violated paragraph 1 of the Sherman Act which forbids combinations or conspiracies in restraint of interstate trade or commerce. Holding that the complaint failed to state a cause of action on which relief could be granted under the Act, the District Court dismissed. The case is before us on direct appeal, 15 U.S.C. paragraph 29, and the only question we must decide is whether the District Court's dismissal was error. We hold it was.

Government's Case

"In summary the Government's complaint alleges: Defendants are (1) a Chicago trade association of plastering contractors; (2) a local labor union of plasterers and their apprentices; (3) the union's president. These contractors and union members employed by them do approximately 60 percent of the plastering contracting business in the Chicago area of Illinois. Materials used in the plastering, such as gypsum, lath, cement, lime, etc., are furnished by the contractors. Substantial quantities of this material are produced in other states, bought by Illinois building materials dealers and shipped into Illinois, sometimes going directly to the place of business of the dealers and sometimes directly to job sites for use by the plastering contractors under arrangements with the dealers.

"The practical effect of all this is a continuous and almost uninterrupted flow of plastering materials from out-of-state origins to Illinois job sites for use there by plastering contractors. Restraint or disruption of plastering work in the Chicago area thus necessarily affects this interstate flow of plastering materials adversely. Since 1938 the Chicago defendants have acted in concert to suppress competition among local plastering contractors, to prevent out-of-state contractors from doing any business in the Chicago area and to bar entry of new local contractors without approval by a private examining board set up by the union. The effect of all this has been an unlawful and unrea-

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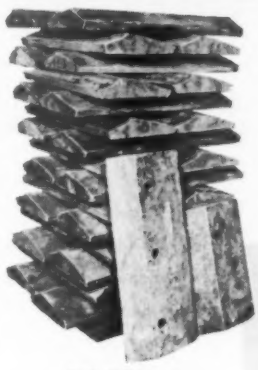

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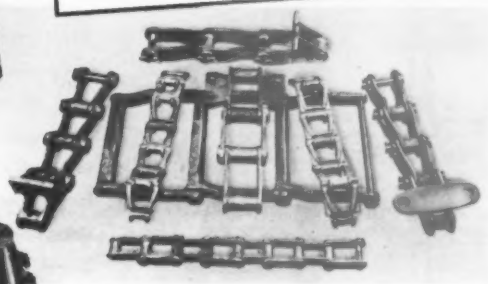

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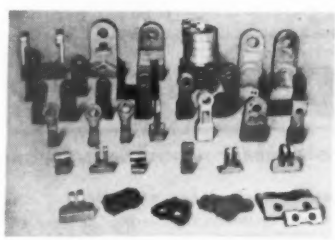

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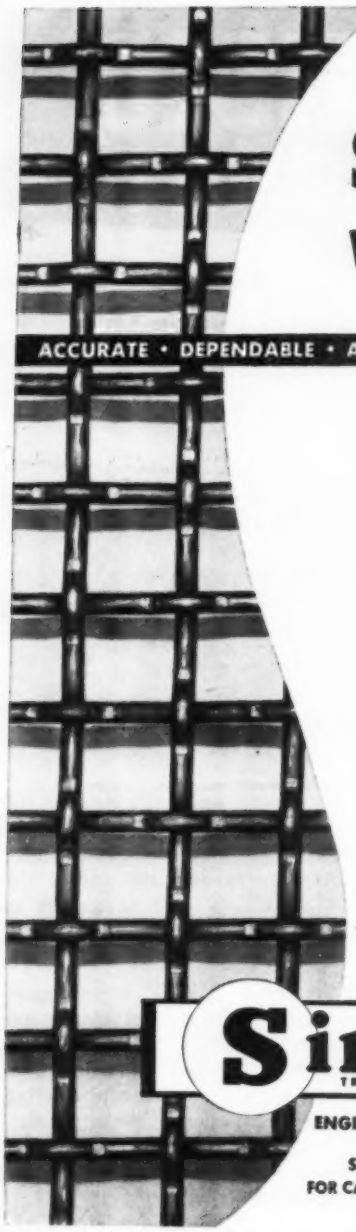

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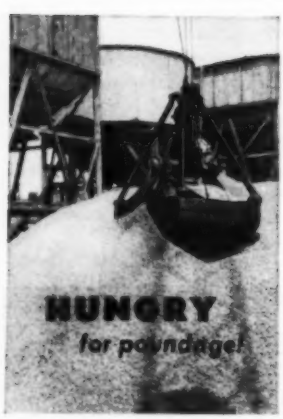

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sonable restraint of the flow in interstate commerce of materials used in the Chicago plastering industry.

District Court's Decision Off

"The District Court did not question that the foregoing and other factual allegations showed a combination to restrain competition among Chicago plastering contractors. But the court considered these allegations to be 'wholly a charge of local restraint and monopoly,' not reached by the Sherman Act. And the court held that there was no allegation of fact which showed that these powerful local restraints had a sufficiently adverse effect on the flow of plastering materials into Illinois. At this point we disagree. The complaint plainly charged several times that the effect of all these local restraints was to restrain interstate commerce. Whether these charges be called 'Allegations of fact' or 'mere conclusions of the pleader,' we hold that they must be taken into account in deciding whether the Government is entitled to have its case tried.

"We are not impressed by the argument that the Sherman Act could not possibly apply here because the interstate buying, selling and movement of plastering materials had ended before the local restraints became effective. Where interstate commerce ends and local commerce begins is not always easy to decide and is not decisive in Sherman Act cases. However this may be, the complaint alleged that continuously since 1938 a local group of people were to a large extent able to dictate who could and who could not buy plastering materials that had to reach Illinois through interstate trade if they reached there at all. Under such circumstances it goes too far to say that the Government could not possibly produce enough evidence to show that these local restraints caused unreasonable burdens on the free and uninterrupted flow of plastering materials into Illinois. That wholly local business restraints can produce the effects condemned by the Sherman Act is no longer open to question.

"The Government's complaint may be too long and too detailed in view of the modern practice looking to simplicity and reasonable brevity in pleading. It does not charge too little. It includes every essential to show a violation of the Sherman Act. And, where a bona fide complaint is filed that charges every element necessary to recover, summary dismissal of a civil case for failure to set out evidential facts can seldom be justified. If a party needs more facts, it has a right to call for them under Rule 12 (e) of the Federal Rules of Civil Procedure. And any time a claim is frivolous an expensive full dress trial can be avoided by invoking the summary judgment procedure under Rule 56.

"We hold it was error to dismiss the Government's complaint for failure to state a cause of action.

"This leaves the separate contention of the union that it is immune from prosecution for violation of the Sherman Act because of paragraph 20 of the Clayton Act. This contention has no merit under the allegations of the complaint here because they show, if true, that the union and its president have combined with business contractors to suppress competition among them.

"Reversed."

NEW INCORPORATIONS

Elgin Ready Mix, Inc., Elgin, Ill., was recently incorporated by Clarence J. Crays, James V. Barthemio and James Carlino. Mr. Carlino is associated with **Elgin Sand & Gravel Co.,** with which the new company will be affiliated. The charter provides for the issuance of 5000 shares of common stock, $10 par value each.

Kingman Sand & Gravel Co., Inc., Kingman, Kan., has been granted a corporation charter. Capitalization was authorized at $10,000. Myron L. Gilbert is resident agent.

Sperr Concrete Works, Inc., Buffalo, N. Y., was recently incorporated by Robert W. Marshlow, James T. McFarland and Beulah Bowen. Capitalization consists of 200 shares of stock.

Perry Ready Mix Concrete Co., Inc., Hazard, Ky., has been incorporated by T. G. Bingham, Virginia N. Bingham and Richard W. Asher. Capitalization was listed at $10,000.

Highway Drainage Pipe, Inc., Mt. Sterling, Ky., has been incorporated for $100,000. R. J. Reynolds, William R. Reynolds and William C. Clay, Jr., are the incorporators.

New London Transit Mix Co. has filed articles of incorporation at Mt. Pleasant, Iowa. Officers of the company are Ralph C. Miller, president and treasurer, and Howard T. Miller, vice-president and secretary.

Whitehall Cement Co., Inc., Dallas, Texas, was recently incorporated with $1000 in capital stock. The incorporators are S. A. Guiberson, Jr., W. D. White, and Burney C. Grigge.

Superior Concrete of Elkton, Inc., Elkton, Va., has been incorporated with $10,000 capital. Paul S. Hartman is president.

Lea County Sand and Gravel, Inc., Eunice, N. M., was recently granted a corporation charter to carry on sand and gravel operations in the State of New Mexico.

Continental Granite Corp., New York, N.Y., has been incorporated by John H. Sullivan, with 200 shares of stock, no par value.

New Mica Company

NEVADA MICA MANUFACTURING CO., was recently organized for the purpose of establishing a mica processing plant in Nevada.

Sauerman Scraper stores and reclaims 150,000 tons of stone on space between dock and cement mill.

Sauerman earthmoving machines have been providing efficient, economical materials handling in pits, quarries, and strip mines for over forty years. Low in first cost, they perform equally well for excavating, stripping, reclaiming and stockpiling.

One man operation, plus long life and low maintenance, insures low cost per cu. yd. handled.

DRAG SCRAPER EXCAVATOR

An economical machine for hill or pit excavation, reclamation and handling of materials, wet or dry. A rapid conveyor for long range earthmoving. Sizes ⅓ to 15 cu. yds. Ask for Catalog A.

DRAG SCRAPER WITH CRANE

Dragline capacity is increased up to 50% or more on many jobs when a Crescent Scraper is used. Machine range is greatly extended when the scraper is used with a track cable and carrier. Ask for Catalog J.

SLACKLINE CABLEWAY EXCAVATOR

Unequalled for operations that require deep digging — especially underwater — and conveying to a high delivery point. Reaches down a hundred ft. or more—spans up to 1,000 ft. Sizes ⅓ to 3½ cu. yds. Ask for Catalog C.

DRAG SCRAPER STOCKPILER

As with all Sauerman machines, storing and reclaiming with a drag scraper stockpiler is a one man operation. It handles most any material, both indoors and out. Ask for Catalog E.

Write to Sauerman's experienced engineers for the size and type system best suited to your digging, hauling or storage requirements.

Sauerman Bros., Inc. 530 S. Clinton St. Chicago 7, Ill.

SAUERMAN BROS., Inc.

KEEP ABREAST WITH INDUSTRY TRENDS THROUGH ROCK PRODUCTS

Slurries... *handled at lower cost*

The new WILFLEY MODEL K Centrifugal Sand Pump embodies important mechanical improvements especially adapted to the handling of cement slurry and results in stepped-up production and substantial power savings. Individual engineering. Write for details.

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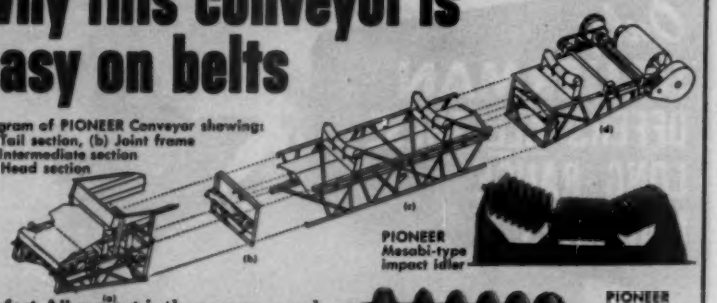
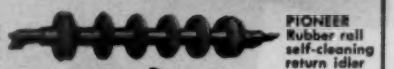
Buy WILFLEY for Cost-Saving Performance

WILFLEY centrifugal PUMPS

Why this conveyor is easy on belts





Perfect Alignment is the answer...and far less belt replacement is the result.

First, PIONEER Continuflo Conveyors are jig-built at the factory, with joint frames between the sections to keep them straight and true.

Second, Head and tail pulleys are of large diameter to prevent belt slippage.

Third, Flexible rubber impact idlers absorb shock of falling materials, thus reducing cutting and wear of belt.

Fourth, Specially-designed self-aligning troughing idlers, in addition to forward tilt of regular idlers, hold belt in line.

Fifth, New-type self-cleaning rubber return idlers virtually eliminate build-up of abrasive materials on roller.

Sixth, Rollers and idlers turn easily. Anti-friction bearings are used throughout. This also cuts power requirement.

Needs fewer support towers

Another outstanding feature of PIONEER Conveyors is their extra strength and rigidity. Angle iron construction, welded vertical and diagonal braces, and upper and lower chords tied together with lattice-frame construction make it possible to space support points as far apart as 40 feet.

It's easy to assemble PIONEER conveyors because no section is over 10' in length. Head and tail sections are specially built to meet your H.P. requirements. For details, write Pioneer Engineering Works, Inc., Minneapolis 13, Minn. (subsidiary of Poor & Company, Chicago).

Pioneer *Continuflo* EQUIPMENT

MODERNIZE YOUR PLANT with Cedarapids-Schrock MOTORIZED HEAD PULLEYS

Here's a plant modernized with Motorized Head Pulleys that cut conveyor downtime up to 90% because all moving parts are inside the pulley shell! You save labor, too. On the installation shown at the left, the control switch enables the truck driver to pull up and load his own truck simply by pressing the button.

HUNDREDS OF INDUSTRIES ARE REDUCING CONVEYOR DOWNTIME 70% to 90%

• NOW you can eliminate maintenance headaches on your belt or belt-bucket conveyor installations. With Cedarapids-Schrock Motorized Head Pulleys there are no chains, sprockets, sheaves out in the weather and dirt, no chain idlers to keep adjusted and oiled, no V-belts to adjust or replace, no shafts and drives to service or lubricate. *There is no other pulley like it!*

The next time you're down for weather, between jobs, or shut down for any reason, provide for future cuts in maintenance costs by modernizing your plant with *Motorized* Head Pulleys. Your Cedarapids distributor can give you the money-saving details.

Built for sale in Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Washington, and Utah by

YUBA MANUFACTURING CO. (Pulley and Sprocket Dept.) **Benicia, California**

IOWA MANUFACTURING COMPANY, Cedar Rapids, Iowa, U.S.A.

MANUFACTURERS NEWS

The Davison Chemical Corp., Baltimore, Md., announces that Dr. P. L. Veltman has been named director of research and development. He was formerly manager of the Curtis Bay laboratories. Ralph E. Hope, formerly manager of research engineering, has been made an assistant director. L. L. Baral has succeeded him as manager of research engineering. W. K. O'Loughlin has also been named an assistant director. He was formerly manager of the development department and is succeeded by O. D. Myrick.

Westinghouse Electric Corp., Pittsburgh, Penn., has announced the appointment of Latham E. Osborne as executive vice-president and a member of the board of directors. He was formerly executive vice-president of defense products. Mr. Osborne will be succeeded as vice-president by Leslie E. Lynde, formerly vice-president in charge of the aviation gas turbine division.

St. Paul Hydraulic Hoist Div., Gar Wood Industries, Minneapolis, Minn., has appointed Chicago Hoist & Body Co., Chicago, Ill., as distributor in Illinois counties of DuPage, Will, Kankakee, Iroquois, Ford and the southern portion of Cook, and Indiana counties of Lake, Porter, Newton and Jasper.

Hewitt-Robins, Inc., Stamford, Conn., has announced the appointment of Ralph E. Johnson as manager of the Houston, Texas, district of the south central division. He was formerly field engineer in the Richmond, Va., area.

American Brake Shoe Co., New York, N.Y., has purchased the welding machinery business of Leader Welding & Manufacturing Co., Berkeley, Calif. The complete Leader line of automatic welding equipment will be sold by the welding products department of the American Manganese Steel Division.

International Harvester Co., Chicago, Ill., has announced the appointment of Ralph M. Buzard as manager of the motor truck sales department. He succeeds W. K. Perkins who, as staff assistant to the vice-president, will work on special assignments.

Euclid Division, General Motors Corp., Cleveland, Ohio, announces the appointment of Sierra Machinery Co., Inc., Reno, Nev., as distributor in the state of Nevada with the exception of White Pine, Elko and Clark counties adjoining Utah but including counties of Modoc, Lassen, Alpine and Mono, and those portions of Plumas, Sierra, Nevada, Placer and Eldorado counties east of Highway 89.

The Jeffrey Mfg. Co., Columbus, Ohio, announces that L. H. McReynolds has been appointed manager of public relations to succeed W. B. Montague who has resigned to accept

a position in Cleveland, Ohio. A. D. Mahoney continues as sales promotion manager and Nevin J. Rodes has been placed in charge of trade paper advertising.

Sintering Machinery Corp., Netcong, N. J., announces the appointment of the Lee Redman Equipment Co., Phoenix, Ariz., as sales representative in the entire state of Arizona and neighboring portions of New Mexico.

Osgood-General, Marion, Ohio, announces the appointment of William H. McAllister as division sales manager for Texas, Oklahoma, Kansas and western Missouri, with headquarters in Dallas, Texas. Willard K. Heth is division service representative.

Koehring Co., Milwaukee, Wis., has appointed Gil Boers Equipment Co., Inc., Chicago, Ill., as distributor in northeastern Illinois and some counties in northwestern Indiana.

The Baker-Raulang Co., Baker Industrial Truck Div., Cleveland, Ohio, announces that William A. Bauer, chairman of the board, has been elected president to succeed James W. Moran, who has retired. Charles N. Sumwalt, Jr., formerly vice-president in charge of the eastern sales division, has been appointed executive vice-president.

Cleveland Rock Drill Division, Le Roi Co., Cleveland, Ohio, announces that Joseph A. Bogan has been appointed director of public relations. He was formerly assistant to the vice-president and director of research for Bituminous Coal Research, Inc., national research association for bituminous coal.

Blaw-Knox Co., Pittsburgh, Penn., has announced completion of its negotiations to acquire the All Purpose Spreader Co., Elyria, Ohio, including the firm's line of highway construction equipment. Sales and distribution will be coordinated with other Blaw-Knox highway equipment.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has assumed operation of The Buda Co., Harvey, Ill., which will be operated as The Buda Co., a division of Allis-Chalmers. Ralph K. Mangan, who has been with Buda for 36 years and president since 1950, has been named president and general manager of the division.

Hewitt-Robins, Inc., Stamford, Conn., has announced the appointment of F. L. Griffith, Jr., as general sales manager of the rubber and conveyors division, Stamford, Conn., and F. W. Blanchard as manager of operations of the industrial rubber division in Buffalo, N.Y.

General Refractories Co., Philadelphia, Penn., announces that Nelson W. Bowman has been appointed district sales manager in Philadelphia. He was formerly district sales manager in New York and will be succeeded by Edward E. Christopher. Thomas F. Fallon succeeds Mr. Christopher in

LIGHTWEIGHT AGGREGATE
MADE BY
DWIGHT-LLOYD® SINTERING
is of HIGH QUALITY
It's uniform, light, strong and chemically inert, with excellent wet-dry contraction characteristics — it's highly resistant to repeated freezing and thawing.
PRODUCED AT LOW COST
Combines greater output — a Dwight-Lloyd plant using a standard model machine with a 50' hearth length has a nominal capacity of 425 cubic yards per day; with low fuel consumption — uses 2/3 less fuel than any other process.
with LOW CAPITAL INVESTMENT
The Dwight-Lloyd sintering machine is usually less than 25% of the cost of a new plant.
Complete Plants Designed and Erected

Write for new Bulletin 380 describing sintered LWA.

DWIGHT-LLOYD, Inc.

DIVISION OF SINTERING MACHINERY CORPORATION

135 Sinter Avenue • Netcong, New Jersey

KEEP ABREAST WITH INDUSTRY TRENDS THROUGH ROCK PRODUCTS

CAN YOU WELD MANGANESE . . . ?

Can you weld it easily without peening, weaving, or other special techniques?

YOU CAN — if you use . . .

MANGANAL

U.S. Patents 1,876,738—1,947,167—2,021,945

FLO-KOTE

11% - 13½%
MANGANESE-NICKEL STEEL
AC-DC WELDING ELECTRODES

NOT A COMPOSITE ROD.
ELEMENTS IN ROD, NOT COATING.

Runs as easily as stainless or mild steel electrodes.

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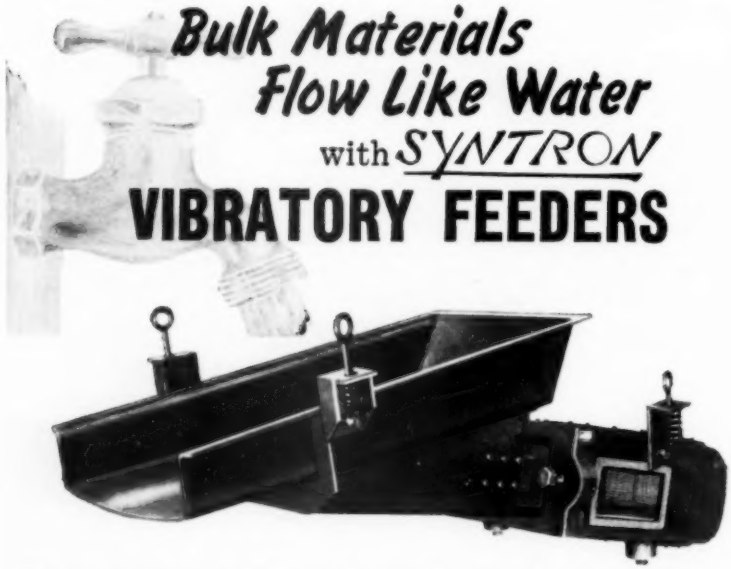
STULZ-SICKLES CO.

NEAREST DISTRIBUTOR UPON REQUEST

SOLE PRODUCERS 92 N. J. RAILROAD AVE. NEWARK, N. J.

Bulk Materials Flow Like Water
with SYNTRON
VIBRATORY FEEDERS



Like a smooth, regulated flow of water, Syntron Feeders move bulk materials from bins, hoppers and chutes to conveyor belts, ball mills, mixers and other processing installations. Easily installed for automatic or semi-automatic set-ups. Handle most materials from fine powders to coarse, heavy lumps, at controllable feeding rates from a few pounds to hundreds of tons per hour.

Write today for complete catalogue data — Free

SYNTRON COMPANY
450 Lexington Avenue Homer City, Penna.

St. Louis. David R. Sieber has been named consultant in the Pittsburgh office. He was formerly district sales manager and will be succeeded by Ward M. Troutman. Fred W. Schwartz has been made assistant district sales manager. Paul M. Johnson, formerly with Youngstown Sheet & Tube Co., has been appointed sales engineer in Philadelphia.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., announces that Willis G. Scholl, vice-president in charge of the tractor division, has been elected to the board of directors. Mr. Scholl has been with the company since 1936.

Erie Strayer Co., Erie, Penn., is the new name of the Erie Steel Construction Co., which has been changed after 41 years in business. The company has for many years been manufacturing buckets, bins, batching equipment, overhead electric cranes, and Aggre-Meters.

E. D. Bullard Co., San Francisco, Calif., announces that E. W. Bullard, president, has been appointed international sponsor of the Turtle Club.

Arkell & Smiths', Canajoharie, N.Y., has announced the election of Robert F. Searle as vice-president in charge of production and engineering of plants at Canajoharie, N.Y., Wellsburg, W. Va., and Mobile, Ala.

L. A. Young Spring & Wire Corp., Detroit, Mich., has purchased the assets of the Daybrook Hydraulic Corp. of Bowling Green and Upper Sandusky, Ohio, which now becomes the Daybrook hydraulic division.

The Howe Scale Co., Rutland, Vt., has appointed Carl Hoel as Minneapolis branch manager. He was formerly service manager for the branch at Atlanta, Ga.

The Dayton Rubber Co., Dayton, Ohio, announces that J. D. Hershey, who has been sales promotion manager of the mechanical sales division, has been appointed director of sales promotion and advertising. R. L. Wetzel has been named director of public relations.

Kennedy-Van Saun Mfg. & Eng. Corp., New York, N.Y., announces that Jean Comte, formerly general superintendent of the Corcemar Cement plant in Mendoza, Argentina, has joined the sales-engineering staff and will make his headquarters in Manila, P. I.

Morse Chain Co., Detroit, Mich., has appointed the Power Transmission Equipment Co., Chicago, Ill., as distributor in 21 Illinois counties and six Indiana counties in the Chicago and adjoining industrial areas.

American Pulley Co., Philadelphia, Penn., announces the election of W. Randle Mitchell and H. Merrill Bowman as vice-presidents. Mr. Mitchell is controller of the company and Mr. Bowman is in charge of sales and advertising.

CONCRETE PRODUCTS

A SECTION OF ROCK PRODUCTS

CONCRETE UNITS · READY-MIXED CONCRETE

Lift-slab method of reinforced, precast concrete floor construction

Virginia Cement Block Company

GETS "A MUCH BETTER BLOCK" with DURAPLASTIC*

I. E. SEPPI of the Virginia Cement Block Company, Virginia, Minn., says, "We find Atlas Duraplastic Cement reduces breakage at the machine to a minimum and produces a much better block in appearance and strength." Left, at the machine, Wilho Seppi is making Duraplastic block.

With Duraplastic you can make a more cohesive, rubbery mix that holds together better, feeds easily through machines. What's more, users report increased resistance to passage of water through finished products. No wonder Duraplastic Cement is widely preferred for concrete block, brick, pipe, drain tile and silo staves!

And gets orders for jobs like this:

"Thrifty" says:
When you can give your customers a better block... and have fewer culls and throwbacks at the same time, it really pays to insist on Duraplastic. That's why Virginia Cement Block Company uses it exclusively.
"Nifty" says:
Clean, true edges and corners of Duraplastic-made blocks helped Virginia Cement Block Company land the order for this big warehouse in Hibbing, Minn.

YET DURAPLASTIC COSTS NO MORE

It sells at the same price as regular cement and requires no unusual changes in procedure. Complies with ASTM and Federal Specifications. For descriptive booklet, write Universal Atlas Cement Company (United States Steel Corporation Subsidiary), 100 Park Avenue, New York 17, N. Y.

OFFICES: *Albany, Birmingham, Boston, Chicago, Dayton, Kansas City, Minneapolis, NewYork, Philadelphia, Pittsburgh, St. Louis, Waco.*

"Duraplastic" is the registered trade mark of the air-entraining portland cement manufactured by Universal Atlas Cement Company.

ATLAS®

DURAPLASTIC

AIR-ENTRAINING PORTLAND CEMENT

CP-D-152R

Makes Superior Concrete Products at No Extra Cost

UNITED STATES STEEL HOUR—Televised alternate weeks—See your newspaper for time and station.

INDUSTRY NEWS

Adds Hardware Division

MAULE INDUSTRIES, INC., Miami, Fla., large producer of concrete block, has announced the establishment of a Builders' Hardware Division at the company's N. Miami Ave. plant and sales office in Miami. The opening of this new department was said to be a part of the company's long-range program to furnish builders and contractors within its production area with a complete line of building materials and builders' supply service. Melvin E. Davis, formerly sales manager of Lindsley Lumber Co.'s hardware, paint and specialty department, and sales manager of the wholesale division of Dania Supplies Co., is head of the new Maule Industries department.

Cover Picture

ON THIS MONTH'S CONCRETE PRODUCTS COVER is an illustration showing the lift-slab method of construction developed by Southwest Research Institute, San Antonio, Texas which is coming into increasing use. Essentially, the reinforced, precast slab floor is poured on the site with the steel columns in place. As each floor is sufficiently cured, it is lifted into place with 50-ton jacks and anchored to the steel columns. A story about this unique method of construction appears in this issue.

Prestressed Bridge

IOWA CONCRETE BLOCK CO., Des Moines, Iowa, recently supplied the precast slabs for Iowa's first prestressed concrete bridge, erected on a Mahaska County secondary road in Union Township. Seven 3-ft. 2-in. x 24-ft. slabs were used for the bridge deck. The slabs, forming the center of the deck, weighed 4½ tons each, and the two outside sections weighed 5½ tons each. About 1500 lb. of reinforcing steel were used in each slab. The side railings were also precast at the company's Hampton plant.

Supervisors, engineers and bridge foremen from ten Iowa counties were present to observe the erection of the bridge. Also attending were members of the State Highway Department and personnel from Iowa Concrete Block Co. Karl Fischer, salesman for the concrete company, was host for the visitors and explained to them the outstanding features of this type of bridge construction.

Ready-Mix Plant

LE VALLEY READY-MIX CO. has started operation of its new $100,000 ready-mixed concrete plant at Sun Valley, Calif., which will serve the entire San Fernando Valley. The company also operates a sand and gravel plant. Owner of the company is Chauncey T. Le Valley, formerly associated with Consolidated Rock Products Co., Los Angeles, Calif. Officers of the company are Mr. Le Valley, president; Harvey Kruse, vice-president; and Gordon A. MacDonald, secretary-treasurer.

Acquires Concrete Firm

ALBUQUERQUE GRAVEL PRODUCTS CO., Albuquerque, N. M., large producer of sand, gravel and ready-mixed concrete, has acquired the equipment and property of Dunham Concrete Co., also of Albuquerque. The sale included 100 acres of land owned by Dunham, including a sand and gravel operation, as well as a concrete batching plant. Albuquerque Gravel plans to discontinue the crushing and screening operations but will continue to operate the batching plant.

Albuquerque Gravel Products Co. was founded in 1945 by John S. Sundt, president, and Eugene Sundt, vice-president, who also own the M. M. Sundt Construction Co., Tuscon, Ariz. Ward W. Anderson is secretary-treasurer.

Stockholders' Report

AMERICAN-MARIETTA CO., Chicago, Ill., at its recent annual stockholders' meeting, revealed that its sales and net profit for December and January, the first two months of the company's 1954 fiscal year, were well ahead of those for the same period of the preceding year. Sales for the two months were estimated at 10 percent over the previous year, while backlog of orders for precast concrete construction were said to be more than double that of a year ago.

Two New Iowa Associations

THE IOWA CONCRETE MASONRY ASSOCIATION and the Iowa Concrete Drain Tile Association were formally launched March 16 and 17, with organization meetings being held at the Hotel Savery, Des Moines, Iowa.

Cambridge Builders Supply Co., Cambridge, Mass., uses the bucket of its Baker-Lull 4-A Shoveloader in its cinder block production as a volumetric measuring device for measuring cinders into a company truck for delivery to the batcher

MILNE READY-MIXED CONCRETE, INC., Boulder, Colo., is expanding its plant facilities by the addition of five hopper bins for the storage of sand and four grades of aggregate; a screw conveyor to carry calcium chloride to the mixing tower; heating facilities to maintain operations during cold weather; and new delivery units.

CONSTRUCTION MATERIALS CO., St. Louis, Mo., large ready-mixed concrete producer, recently purchased a 45-acre tract in Overland, Mo., for the establishment of a new ready-mixed concrete plant. Edwin G. Asche is president.

MONTELLO CRUSHED GRANITE CORP., Montello, Wis., was recently incorporated with an authorized capital of 500 shares of common stock no par value. The incorporators are Vincent and Dan R. McNamara, Clarence Troost and Robert T. MacHolz, with Vincent McNamara serving as registered agent.

VAN AND VAN CONCRETE, INC., Dallas, Texas, has been incorporated by George E. Van, Fred L. Maurer and Billy F. Burns. Capital stock was listed at $1000.

WALTERS SAND CO., INC., Manhattan, Kan., has been incorporated with $100,000 capital. The incorporators are John A. Walters, O. W. Kershaw and Joseph W. Menzie.

FAIRBANKS READY-MIX CONCRETE CO., INC., has been incorporated in Los Angeles County, Calif., with an authorized capital of $100,000. The owners and directors are Francis E., Helen Jean, and Jack Fairbanks, Compton, Calif.

THE MARBLE CLIFF CONCRETE PRODUCTS CO., Columbus, Ohio, was recently incorporated with 125 shares of no-par common stock. The incorporators are K. F. McGee and Milton G. Glas, with Mr. Glas also serving as statutory agent.

THE JACKSON SILICA CO., Jackson, Ohio, has been incorporated with 1000 shares of common stock, no par value. Marshall H. Jones, Frank DeLay and James W. Wells are the incorporators, with Mr. Wells also serving as statutory agent.

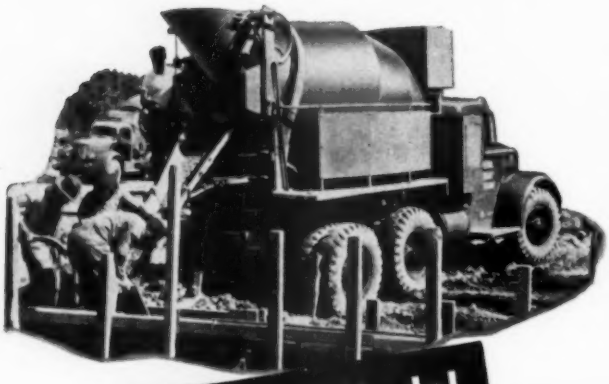
W. E. ANDERSON SONS CO., Columbus, Ohio, has announced a change in its corporate name, to Anderson Concrete Corp., effective as of January 1, 1954.

PECOS STONE CO., Houston, Texas, has been granted a 50-year corporation charter. Capital stock was listed at $4000. C. A. Coppenger, W. E. Seale and E. J. Williams are the incorporators.

LAKELANDS CONCRETE PRODUCTS, INC., recently moved its plant to Honeoye Falls, N.Y. Owners of the company are William R. Clarke and Laurance Price. Concrete septic tanks and other concrete products are produced under the tradename of "LaKor."

BRAND NEW TIME-TESTED TRUCK MIXERS

2 Reasons Why SMITH Continues to Lead the Field!



DELUXE Model
— the Finest Truck Mixer that Money Can Buy

You want nothing but the best. Then be sure to investigate the new Smith De Luxe Truck Mixer. It's a brand new mixer, completely redesigned for even greater efficiency. This De Luxe Model weighs 500 lbs. less than the previous De Luxe. Overall length is much shorter. Better weight distribution allows bigger legal payloads. New 2-speed transmission, built to aircraft specifications, has lifetime Helical gears, ground shafts and multiple disc clutches running in oil. The entire engine is easily accessible. All this, with no increase in price. And remember, this De Luxe Model is backed by a company that enjoys recognized leadership in the industry.

PREMIUM Model
— the First Low-Cost High Quality Truck Mixer

If you want to combine economy with top quality, the Smith Premium Model is the answer. It's NOT built down to a price. In fact, it's the world's finest truck mixer, except for the Smith De Luxe Model. This Premium Model is 800 lbs. lighter, size for size, than the De Luxe. Overall height is cut down to get under bins with low headroom. Features include dependable 2-speed transmission, drum speeds from 3 to 15 r.p.m., and dual push button water control — front and rear. Price? Believe it or not, it's MUCH LOWER. You save hundreds of dollars and still get top quality.

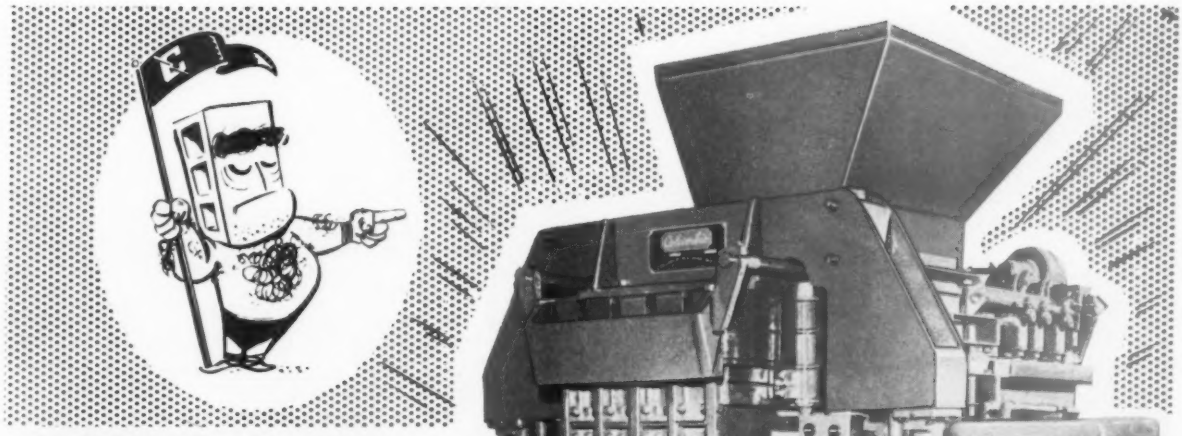
Both of these Models are built to the usual Smith high standard of quality. That's why Smith continues to lead the field. It will pay you to investigate. Contact your nearby Smith dealer — today. Ask for literature.

The T. L. SMITH COMPANY
2885 NORTH 32ND STREET • MILWAUKEE 10, WISCONSIN, U.S.A.
Affiliated with Essick Manufacturing Co., Los Angeles, California

SMITH
THE T. L. SMITH CO. MILWAUKEE U.S.A.

CONCRETE MIXERS

For BIGGER and BETTER Concrete Mixers and Truck Mixers . . . LOOK TO SMITH



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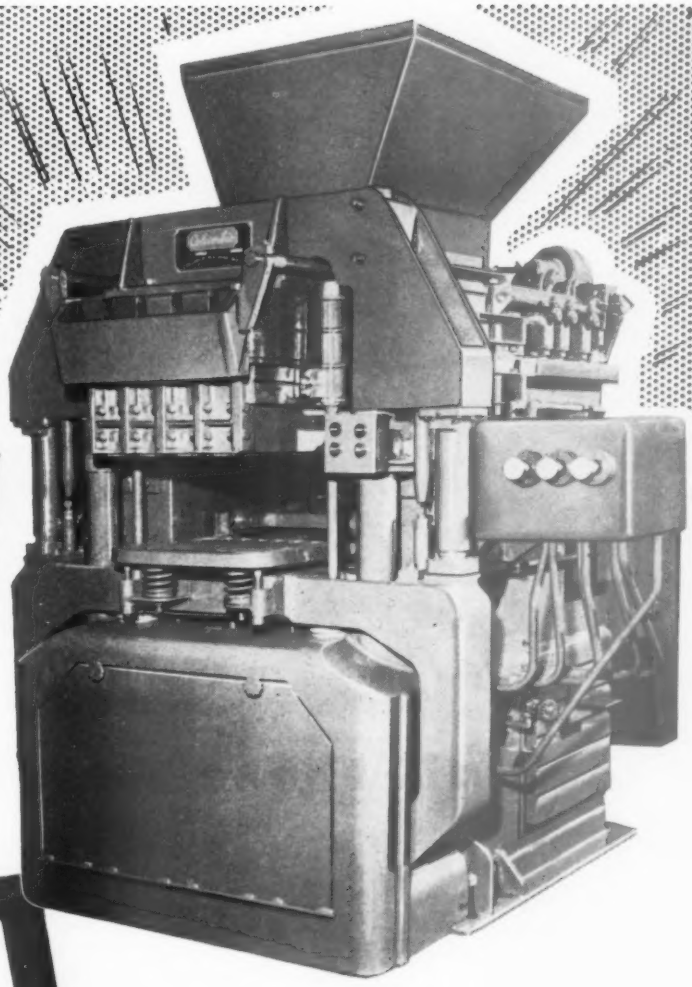
DEPENDABLE!

Columbia

MODEL 8 2-BLOCK

We designed a machine rugged enough for years of uninterrupted production... then added *extra* strength to every member!



ask for information about *Columbia's* 12" HIGH COMBINATION...

2 AND 3-BLOCK MACHINES

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MAKES 12" HIGH — Drain tile... Partition blocks... Flue liners... Silo staves... Water meter boxes... Other shapes!

MAKES 8" HIGH — Standard and special concrete blocks in all shapes.... More than 240 molds available!

MAKES 4" HIGH — All normal blocks in the popular 4-inch height.

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Long-life performance... the result of really rugged engineering and construction!

Lower maintenance costs... fewer production delays... longer service life... more operation at higher cycling speeds... GREATER PROFITS for each dollar of investment and payroll.... These are the benefits of Columbia's advanced design and rugged construction!

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- **Fully-Automatic Electronic Controls**
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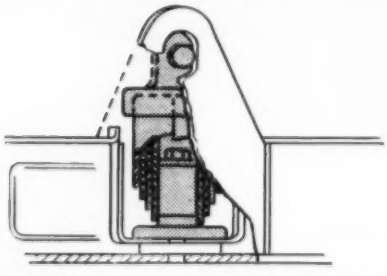
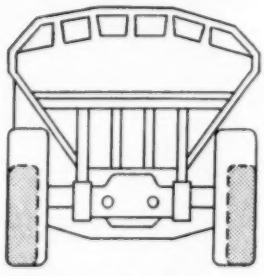


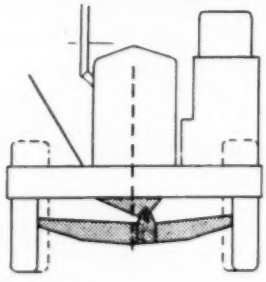
Smooth ride

Heavy, snubber-type spring is mounted between Dumptor main frame and the steering axle. Shock-absorbing action gives plenty of "cushion", takes jolts out of rough, off-road travel. Easy on operator and machine.



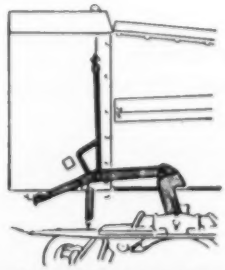
Tires track in direct line

Wider, heavier steering axle puts Dumptor steering wheels in direct line with big drive wheels. Tires track in the same path. There's less rolling resistance — better traction in soft ground and over rough haul roads.



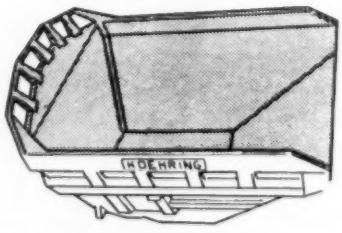
Off-set pivot on axle

Pivot point on steering axle is offset from center line 3¼" toward operator side of machine. There's no sag, even with unbalanced load. Steering axle oscillates 21°, keeps twisting strains out of main frame.



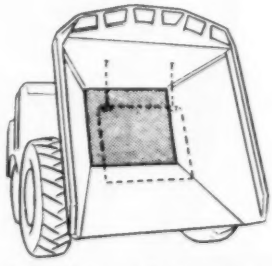
New body-latch, dump lever

Body latch for 1-second gravity dumping is simple, trouble-free. Latch is engaged by a single hook, mounted on the chassis frame. Dump lever is located inside the cab, in an easy-reach position at the operator's left.



Streamlined, all-steel body

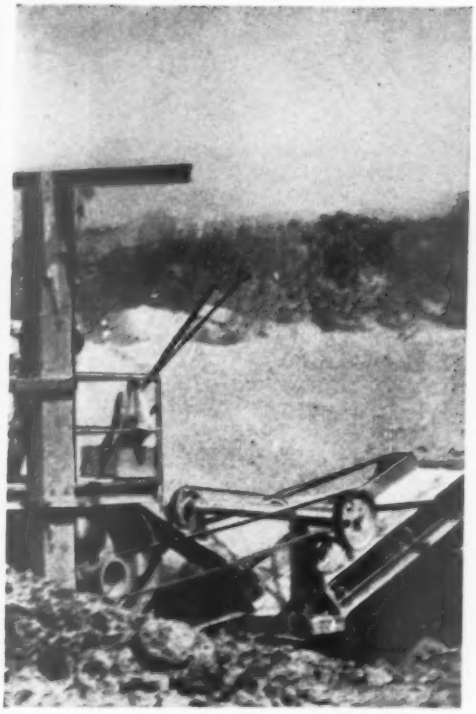
Inside is free of bulges or ledges. Top edge is box-beam constructed. Sides, ends are ribbed with 5 and 8" channels. Double-plate bottom is lined with multiple steel beams. Note ridge bar added to rock-guard teeth.



Bolted or free-swinging pan

Heavy steel kick-out pan is ½" thick. Pan can be bolted to body floor for extra protection when loading rock. Remove bolts, and pan has free swinging kick-out action, breaks suction when dumping sticky loads.

CK43B



advantages

Take another look at the latest-model Koehring 6-yard Dumptor shown here. It has some important features worth checking . . .

Notice how heavy snubber-spring on steering axle cushions road shocks, yet retains Dumptor's unique advantage of no spring maintenance. There are no leaf springs. Big shock absorbing drive tires eliminate need for springs on drive axle. Alignment of drive wheels with steering wheels adds to efficiency of no-turn shuttle hauling — another basic Dumptor advantage.

Instant gravity-dumping is controlled by simple body latch and new dump lever arrangement. Notice, too, the new streamlined all-steel body. Even with all this heavy-duty strength, Dumptor still has more than 6 h.p. for every ton of loaded weight — accelerates fast, climbs 24% grades fully loaded. See your Koehring distributor for more facts.

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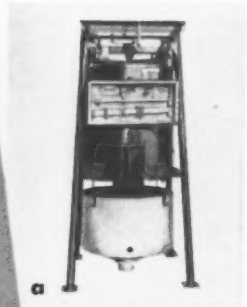
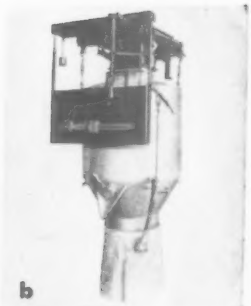
ideas

for low-cost handling of aggregates and cement



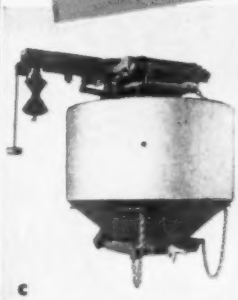
a

Water Batchers
give close quality control of concrete. Semi- or full-automatic. 120 and 240-gal. capacities.



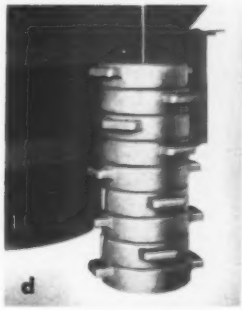
b

Cement Batchers
6 sizes from 10 to 38 cu. ft. Scale capacities from 700 to 3000 lbs. Semi- or full-automatic controls.



c

Single-Material Batcher
properly sized for 1¼ cu. yd. batch. 2560-lb. beam capacity for stone — 1520-lb. beam capacity for sand.



d

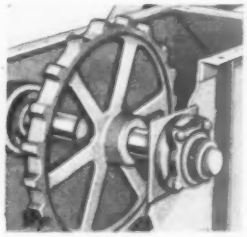
Batcher Test Weights
available in sets of nine 50-lb. calibrated units, and two 25-lb. steel hangers. Assure accurate weigh-batching.

e

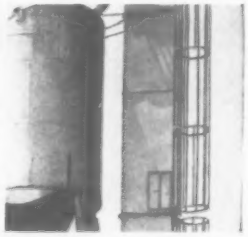
Yard Bin
is ideal for loading trucks where no batcher is required. 9-ft. clearance under discharge gate. Holds 35 cu. yds.

f

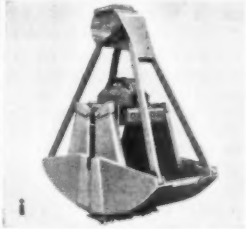
Elevator Buckets, Chains
2 types, 7 sizes of buckets for aggregates and cement. Johnson long-life steel chain has carburized knuckles.



Chain Sprockets
19-tooth, chilled-rim cast iron with heavy split hub, double-rim lugs. Also, 12-tooth cast-chrome manganese.



Elevator Safety Cage
Johnson ladder safety cage, welded to elevator casing, is 28 inches in diameter. Costs only a few dollars per foot.

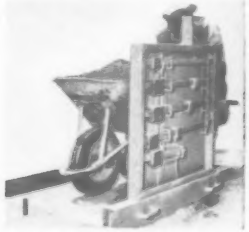


i

Clamshell Buckets
all-welded, smooth inside and out. Fast-filling, easy closing. Manganese cutting edge. 3 types, 10 sizes, ⅜ to 3 yds.

k

Concrete Buckets
3 types: Finger-Tip Control in ½ to 2 cu. yd. sizes; 1 to 4 cu. yd. Johnson-Dravo; and 2 to 8-yd. Lo-Slump buckets.



l

Little Titan Scale
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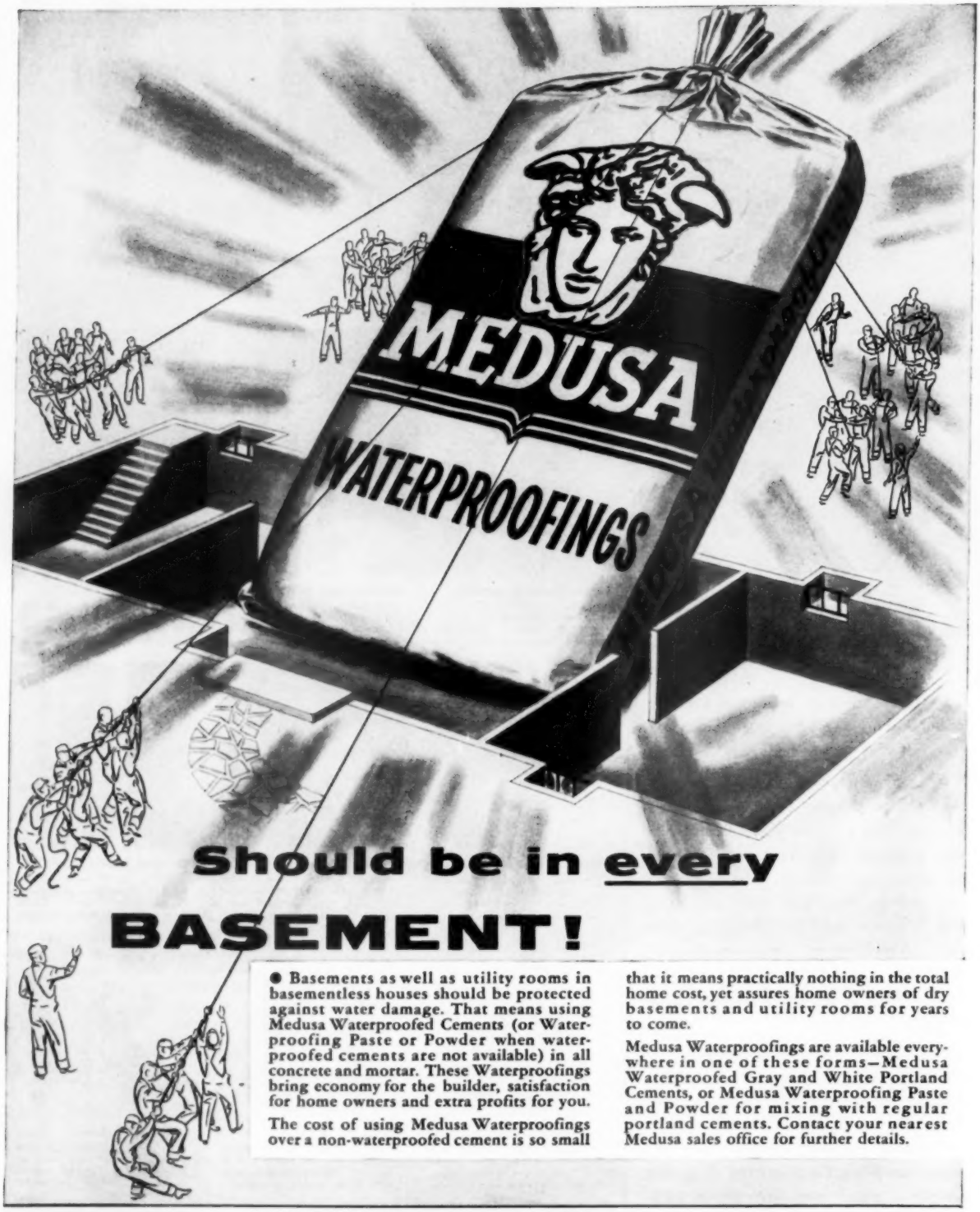

Should be in every BASEMENT!

● Basements as well as utility rooms in basementless houses should be protected against water damage. That means using Medusa Waterproofed Cements (or Waterproofing Paste or Powder when waterproofed cements are not available) in all concrete and mortar. These Waterproofings bring economy for the builder, satisfaction for home owners and extra profits for you.

The cost of using Medusa Waterproofings over a non-waterproofed cement is so small that it means practically nothing in the total home cost, yet assures home owners of dry basements and utility rooms for years to come.

Medusa Waterproofings are available everywhere in one of these forms—Medusa Waterproofed Gray and White Portland Cements, or Medusa Waterproofing Paste and Powder for mixing with regular portland cements. Contact your nearest Medusa sales office for further details.

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Finger-tip control of discharge: Operator starts, stops or completely reverses his drum by lightly moving one lever at front or rear of mixer. Speeds operation, closely controls discharge into carts or buckets. No shock, no clutch slippage at any time.

Yours in the 1954 JAEGER

"Super-Comatic" transmission

Successor to the original TM-15 Comatic, the TM-25 "Super-Comatic" gives every advantage of a *perfected* hydraulic-operated transmission for truck mixers:

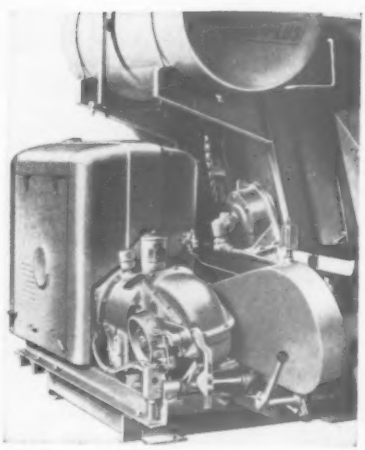
1. **Easy single-lever control of clutches and brake.**
2. **Shock-proof shifting. Automatic brake in neutral.**
3. **Positive clutch engagement by hydraulic pressure. No slippage. No need for adjustment.**
4. **Trouble-free mechanism requiring a minimum of service.**

"Super-Comatic" means foolproof safety and practically eliminates clutch maintenance. Its fast, easy operation and more accurate control of discharge help to speed payload trips.

Send for Catalog TMH-3 or ask your Jaeger distributor to show you the latest construction and operating features of Jaeger Mix Plus models. It will pay you to see why more concrete is today produced by Jaegers than by any other truck mixer.

Designed and perfected for truck mixer operation

Model TM-25 "Super-Comatic" is a rugged, hydraulically-operated transmission with multiple disc forward and reverse clutches, reduction gear and mechanical brake synchronized to act when transmission is in neutral. Brake, hydraulic pump and 4-way control valve are externally mounted for complete accessibility. Entire unit is simple, rugged and truly trouble-free.



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LOADERS • AIR COMPRESSORS • PUMPS • MIXERS • PAVING MACHINES

HAUL MORE PAY LOAD LEGALLY ON SHORT WHEELBASE TRUCKS ... CUT MAINTENANCE COSTS

BLAW-KNOX 5½-CU. YD. 6½-CU. YD. *Hi-Boy* TRUKMIXERS

PEDESTAL AND FLUSH WATER TANK COMBINED

- Requires no more space than for front pedestal of conventional design.
- Reduces distance from center of gravity to front of mixer by 20 inches.
- Permits better weight distribution.
- Water tank is mounted low and cuts weight 1000-lbs. (the weight usually required to support a high tank).
- Short wheelbase allows greater maneuverability.

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- Engine is located for the greatest accessibility. It is easier to maintain than your car because it is placed directly in front of the mechanic. If necessary, engine can be changed in a matter of minutes.

FAST CHARGING

- Inner charging cone allows charging of 1 yd. in 8 seconds . . . or 5 yds. in 40 seconds!
- Big pump capacity and large diameter of pipe assure fast flow of water.

BEST WATER MEASURING SYSTEM AVAILABLE

- Measures by meter (set for any quantity) accurate to 1/10 gallon for the strictest specifications.
- Shuts off automatically when the required quantity is reached.
- No possibility of human error.

SHORT, SQUATTY DRUM DESIGN PRODUCES BETTER MIX

- Meets most exacting specifications, and legally hauls ½ yd. more concrete than conventional designs.
- Special design of open-end drum enables mixer to retain 7 yds. of 6-inch slump concrete on a 10% grade without spilling.

TRANSMISSION LOCATED AT FRONT

- Transmission has only one lever giving operator perfect fingertip forward and reverse control of drum during discharge.
- Up front location eliminates excess weight on rear axle.
- Mounted at side of flush tank and pedestal combination at eye level for easy maintenance.

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It contains everything you need . . . aggregate and concrete batching plants, truck mixer loading plants or central mixing plants, clamshell or concrete buckets, and famous Hi-Boy Trukmixers . . . for a profitable one-source ready-mix set-up.

The HELTZEL TYPE-TWO PLANT

BIG PRODUCTION *Where You Want It!*

This is no "Fancy Dan" piece of equipment. It's a big 200-ton capacity husky that can be quickly erected and dismantled, moved from job to job in large, easy-to-handle sections.

It's fast and accurate . . . no holdups or fouled batches. It's the big, versatile, hard-working plant designed to keep pace with modern concrete construction. It takes any type batcher, including the new Heltzel Automatic Push Button.

If you're in the market for big, high-production, portable equipment, check this **Heltzel Type-Two Plant** before you buy. It's available in the cement-aggregate design, or for aggregates alone. There are batchers, cement plants, elevators, conveyers—everything you'll need, designed to work with it.

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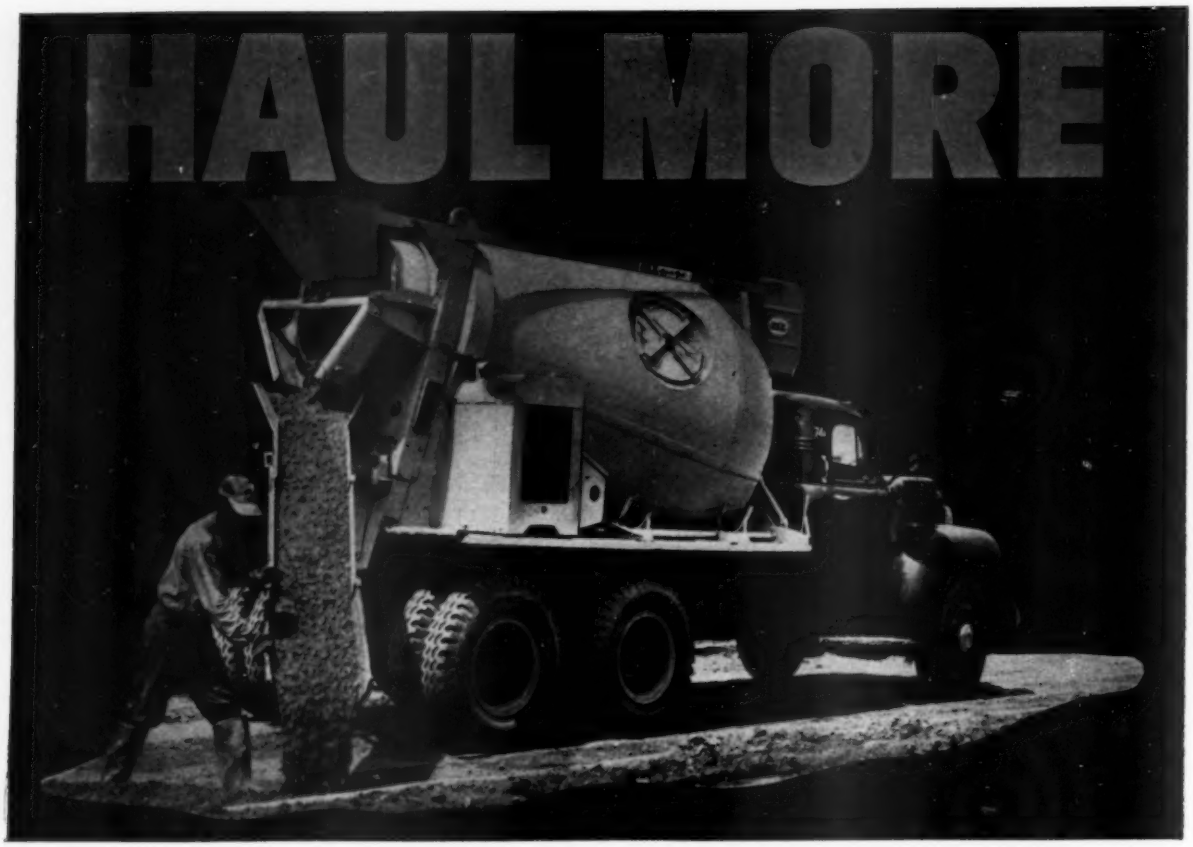

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EVERY TRIP...because the exclusive Rex Adjusta-Wate design places load centers of gravity farther forward so that *all* axles of the truck can be loaded for *maximum legal payload.*

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EVERY SEASON...because the Rex Adjusta-Wate is built for years of dependable, heavy-duty operation, free from costly maintenance. Today, profitable ready-mixed plant operation demands a mixer to roll day after day, all season long without interruption.

The Rex Adjusta-Wate has the rugged construction and balanced design that mean lower maintenance cost, less down time, bigger legal payload...*every season.*

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CHAIN BELT REX COMPANY

CONSTRUCTION MACHINERY

MOTO-MIXERS® MIXERS PUMPS PUMPCRETES® PAVERS

Fig. 1: Ground floor slab has been poured and steel columns are in place

Prestressed Slabs and the

Lift Slab Building Method

New method of construction has opened a wider market for ready-mixed concrete. Floors and roof are poured at ground level, one on top of the other, and then raised by jacks

By M. M. LEMCOE*

THE IDEA OF THE "LIFT SLAB" SYSTEM of construction, which was conceived in 1948 by Architect Phillip Youtz in New York and Tom Slick, a business man in San Antonio, Texas, was later turned over to the Institute of Inventive Research and the Southwest Research Institute for further development and promotion.

*Engineering Mechanics Department, Southwest Research Institute

This method consists basically of pouring the upper floors and roof of a structure at ground level, one on top of the other, and then mechanically lifting them to their proper elevations and anchoring to the columns. The method is most suited to buildings not exceeding several stories, and to concrete slab construction used in conjunction with steel columns.

First, the ground floor slab is poured, Fig. 1. It is assumed that the columns are already in place. The ground is prepared and a moisture membrane is placed prior to pouring. After the surface water has been removed and the slab is at least 18 hr. old, the separating layer is applied. A paraffin base or construction paper is used to prevent the slabs from sticking together. Drying time for the separation is between 20 and 40 min. when the paraffin base is used.

Next, lifting collars are placed around each column as shown in Fig. 1. Two bushing holes are usually provided in each collar. As the collars are lowered on the column, a bushing provided by the lift contractor is placed in each hole. These bushings are necessary for connecting the slabs to the lifting equipment. Since the collars rest flat on the ground floor slab, no cribbing or bracing is required to hold the collar in place.

Then, after the collars are in place, the reinforcing is placed and tied in the usual manner. Electrical conduits, sleeves, stairwell openings, and any other fittings may also be located and placed at this time. Edge forms and screens are set and the lift slab is poured. Compressive test cylinders are taken for each slab and broken at the end of 7, 14, and 28 days. Curing is done on the job, and the cylinders undergo the same exposure conditions as the slab.

A slab is ready for lifting after it

Fig. 2: Control panel for simultaneous operation of the 50-ton jacks

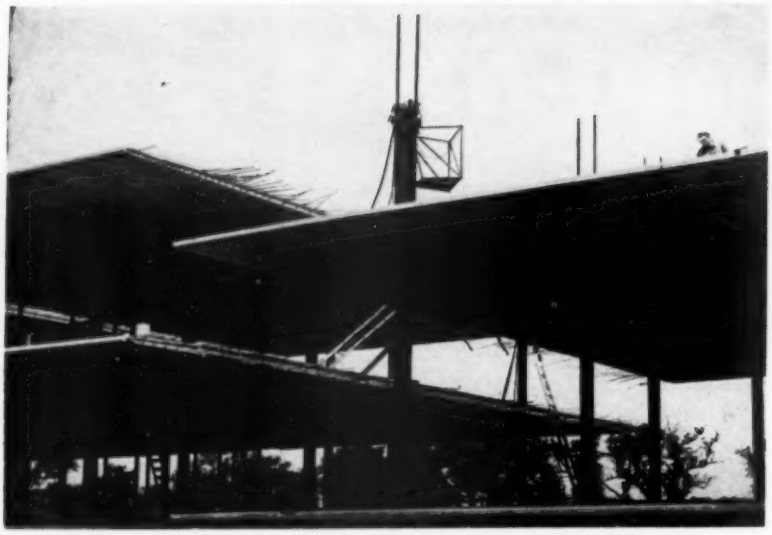


Fig. 3: Slab has been raised by jacks into place and anchored to the columns

has gained a compressive strength of approximately 2700 p.s.i. The lift equipment is set up and properly fastened to the bushings. The slab is lifted about 3 in., and leveled at all column points; then raised to the desired height with periodic level checks. Lifting is accomplished by means of 50-ton jacks which rest squarely on top of each column and are connected to the collar bushings by means of the tension rods. Fig. 2 shows the control panel for simultaneous operation of the jacks. Next, the slab is anchored to the column at each column point. After the welds have cooled at least 30 min., the load of the slab is released from the lifting equipment and allowed to act directly on the welded connection. The lift equipment is then removed and set up for the next slab. This procedure is repeated until the job is completed, Fig. 3.

As soon as a given slab is anchored to the columns, bricklayers, plumbers, electricians, and roofers can immediately resume work.

Use Ready-Mixed Concrete

It is quickly apparent that one of the most important advantages of the lift slab method is that all the structural work on the slabs is done at ground level. Thus, a minimum of labor and equipment is used. Generally, all the concrete can be placed directly from the ready-mixed concrete truck. No draglines or elevators are required. And the handling of steel is simplified, since it is not necessary to hoist the steel into the air before placement.

Moreover, a great majority of the mechanical and electrical portions of the work can be done at ground elevation, and the electrical conduits can be placed in the slab before the concrete is poured. Since one slab rests on the other, a mark made on the lower slab will show up on the ceiling of the upper slab as a perfect "carbon copy" of the lower one. This makes it very easy to secure dead accurate vertical alignment of mechanical and electrical risers as well as partitions.

A considerable amount of form work, shoring, and scaffolding is eliminated, since all slabs are poured at ground level. Workers and construction are protected from adverse weather as soon as a slab is lifted into place. In addition to all the advantages for the workmen, the architect is allowed considerable freedom. The organization of space is almost entirely free from the basic structure. For example, with flat slab construction, the need for spandrel beams is eliminated, and doors and windows may be located anywhere beneath the smooth slab. Since all the live loads and dead loads imposed on the building are carried by the columns, the walls and partitions are nonload-bearing and may be placed or moved at random. Thus, walls can become mere curtains made from many varieties of materials.

The lift slabs of ordinary reinforced concrete are designed according to the American Concrete Institute Building Code for flat slab panels, and individual lift slabs 50- x 150-ft. made of ordinary reinforced concrete have been successfully lifted into position; however, 12 columns were required to make the design possible because of depth-to-span considerations. By resorting to prestressed concrete, on the other hand, the dead load due to slab can be reduced considerably, and the maximum distance between columns increased. By using lightweight concrete, an even greater reduction in slab weight can be obtained. Thus, a greater percentage of the total volume of the building is available in the form of usable space, if prestressed lightweight concrete is used. Also, by cutting down on the number of columns required, other important architectural advantages are gained.

It is not the purpose to compare the costs of conventional lift slabs and prestressed slabs. This much can be said, however: For spans of up to 24 ft., it is questionable as to whether any savings can be realized from a prestressed flat slab design. However, for slabs in excess of 30 ft., a prestressed slab is not only more economical than an unprestressed one, but would probably be mandatory from depth-to-span ratio considerations.

The first two-way prestressed roof slab in the United States to be incorporated in a building was designed and constructed at Southwest Research Institute in 1952. The slab was used as a roof slab for the two-story Engineering Mechanics Building.

The overall dimensions of the slab are 88- x 38-ft. The slab is supported on eight columns with a maximum span length in both directions of 24 ft., with a slab thickness of 6 in. Bear in mind that only the roof slab was prestressed. Since "two story" columns were used, it is evident that the maximum span of 24 ft. was not dictated by the strength of the prestressed slab, but rather it was dictated by the strength of the conventional, unprestressed, second floor slab. Of course, if all the slabs had been prestressed, a much larger span could have been used. It should also be emphasized that this structure was not intended as a demonstration of optimum design in prestressed concrete, but rather it was an opportunity to incorporate for scientific purposes a two-way prestressed slab into a building which otherwise would have been of conventional design throughout.

Before construction started on the full scale roof slab for the Engineering Mechanics Building, a ⅛ scale model of the slab was built to determine the behavior of a flat slab prestressed in two directions. This made the dimensions of the model 14 ft. 8 in. by 6 ft. 4 in. with a slab thickness of one inch. The model was tested to destruction by applying gravel uniformly over the surface in small increments. At each load increment SR-4 strain gage readings were taken over the surface, in addition to mechanical dial gage readings. The model failed at a load of 282 lb. per square foot, indicating a factor of safety of 3.42 against failure. The failure was due to punchout at a collar connection. The final deflection on the cantilever edge before failure, in line with the collar which failed, was approximately ½ in. This would be equivalent to a 3-in. deflection on the actual roof slab.

Since the model tests were satisfactory, work began on the actual roof slab. Ordinary edge forming was used with 2- x 4-in. stakes located at each wire group. A post tensioning system, consisting of high tensile wires with a yield strength of approximately 180,000 p.s.i., was used. To prevent

bond between the wire and the concrete, it was necessary to coat the wires with the proper type of bituminous material. To induce compression in the tension zone only, it was necessary to place the prestressing wires eccentric to the centroid of the section. This was accomplished by placing chairs to the proper height at various locations.

Concrete with a minimum compressive strength of 5000 p.s.i. in 28 days was specified along with a maximum slump of 3 in. High speed vibrators were used to prevent honeycombing. After the concrete had set for ten days, prestressing operations were started. A minimum compressive strength of 3500 p.s.i. was required at this stage.

Prestressing

Prestressing began in the long direction after the roof slab was formed and poured on top of the second floor slab. The roof was poured in two sections with the gap running lengthwise. The sections were notched at intervals along this gap to provide pockets into which the hydraulic jacks were inserted. Prestressing in the long direction was carried on by stressing the individual six wire units by means of hydraulic jacks. When the proper strain increment was obtained, shims were inserted between the bearing plate and stressing bar, and the jacks were removed.

In the short direction, stress was introduced into the wires by separating the two sections of the slab also by means of hydraulic jacks, placed in the pockets along the gap, the wires running continuously across the gap from one slab to the other. The gap was then grouted with a fast setting grout, and the jacks removed when the grout attained the proper strength. To shorten the time of set, calcium chloride was added to the rich grout. In this manner, it was possible to attain compressive strength of 2500 p.s.i. in less than 6 hr. The method of slab preparation presented difficulties, however, since very large jacking forces were required.

A comparison between the amount of materials for the prestressed and unprestressed lift slab design follows:

Item	Prestressed Slab	Unprestressed Slab
Area	3340 sq. ft.	3340 sq. ft.
Thickness	6 in.	8 in.
Vol. of concrete	62 cu. yd.	82.5 cu. yd.
Cost of concrete	$11.25 cu. yd.	$9.75 cu. yd.
Wt. of steel	1.64 lb./sq. ft.	4.5 lb./sq. ft.
Total wt. of steel	5490 lb.	15,000 lb.
Collar reinforcing	None	150 lb. estimated

Cost comparisons were not made for two reasons:

First, the maximum column spacing of 24 ft. was dictated by the strength of the second floor slab, which was of conventional, unprestressed design. Maximum column spans of at least 30 ft. must be used, if real economy is to result from a prestressed design. Thus, it would be unfair to judge the merits of a prestressed design by examination of the cost of this particular prestressed slab, having columns on 24-ft. centers.

"Waffle Type" Slab

And second, the prestressing hardware and prestressing techniques used, while satisfactory for experimental studies, were not suited to rapid and efficient building construction. Thus, it would be unjust to compare the cost of labor for this particular experimental study with the latest commercial prestressing methods. In fact, most recent inquiries reveal that the flat slab design is not the most economical lift slab for prestressing. A "waffle" type lift slab, Fig. 4, coming into more common use, indicates a saving of approximately 50 percent in prestressing steel over the corresponding flat slab design, with little or no added concrete or labor costs. This design is being used for the new three story Physics Building at Southwest Research Institute.

Opens Ready Mix Plant

WARNER Co., Philadelphia, Penn., recently announced the opening of a new ready-mixed concrete plant at its 51st Street Yard on the west side of the Schuylkill River in Philadelphia.

The plant was said to be built particularly for supplying concrete having special aggregates. The four 60-ton aggregate bins are filled by an inclined belt conveyor, with a dump hopper for trucks. The bins were kept comparatively small for ready change of aggregates to meet trade demands. The various aggregates consist of the special gravel sizes produced by Warner Co., and also such materials as slag, lightweight aggregate, etc.

Other plant equipment includes two cement bins with provisions for unloading bulk cars, and a 3-cu. yd. Ransome mixer, which was salvaged from the Wilmington operation when it was replaced by a 6-cu. yd. mixer at that location a short time ago.

Concrete Products Plant

VALLEY CONCRETE Co., newly incorporated, has started operations of a sand and gravel and concrete products plant at Rocky Ford, Colo. The company was recently organized by Vic Ullom and Earl Brubaker, president and plant manager, respectively, of Lamar Concrete Products Co., Lamar, Colo. Mr. Brubaker is in charge of the Valley Ford operations which will include the production of washed concrete aggregates, masons sand, ready-mixed concrete, concrete sewer and drain pipe, culverts, septic tanks and other types of concrete products.

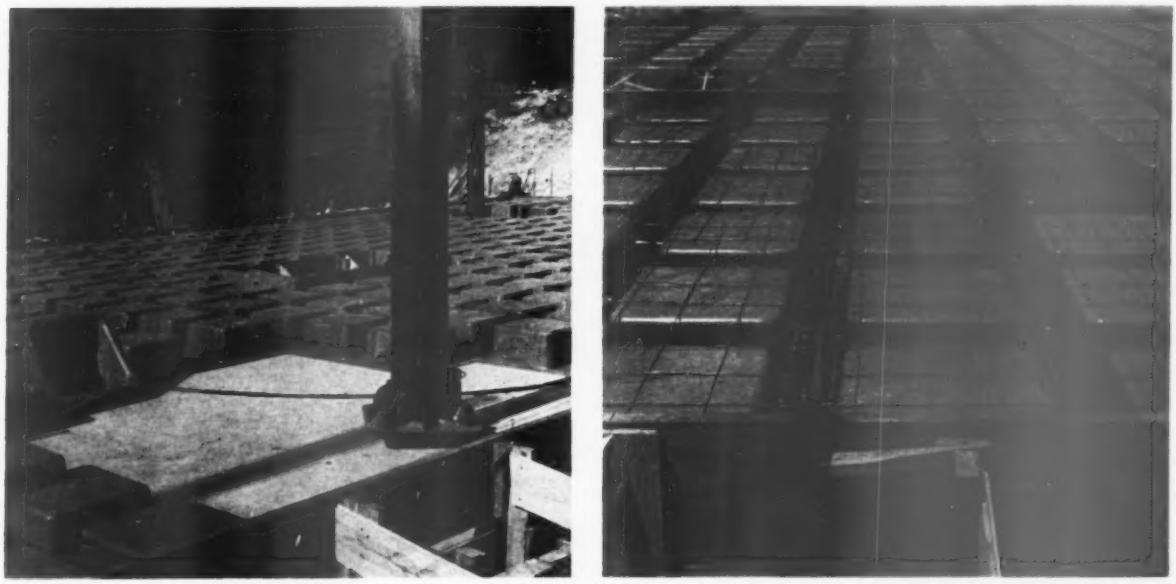


Fig. 4: Showing newer "waffle type" slab forming units, to the left, and reinforcing steel in place ready for concrete to be poured, to the right

Lime, Fly Ash, Silica and Cement in

Autoclaved Concrete Products

Report of investigations at the Research Foundation of the University of Toledo sponsored by National Lime Association, Toledo Edison Co. and others

By JOHN K. SELDEN*

THE AUTOCLAVE PROCESS presents interesting opportunities for producing concrete products from a variety of raw materials including certain waste materials like fly ash. To exploit these opportunities, a great deal of research is needed to determine which materials and what formulations will produce the optimum combination of high quality and low cost, and to observe the behavior of such products in the wall.

Because of the monumental and extremely pertinent researches on autoclaved cement silica mixes by C. A. Menzel of the Portland Cement Association published in the Journal of the American Concrete Institute 20 years ago, there is not such a pressing need for further studies on the simple cement-silica combination except as a standard for comparison of other materials. However, the literature on sand-lime mixes for autoclaved brick is much more scattered and less pertinent to the block industry. And most of the work done by Armour Research Foundation, Rostone, Detroit Edison and others on autoclaved fly ash products has dealt with pressed or tamped bricks, slabs or blocks of high fly ash content rather than with typical vibrated block mixes of predominantly aggregate content. Hence, lime-cement-fly ash-aggregate studies are especially needed. With this need in mind, the Research Foundation of the University of Toledo welcomed the sponsorship of the National Lime Association and of the Toledo Edison Company in setting up the project to be reported here.

*Research Foundation of the University of Toledo

The National Lime project included the following phases:

1. Chemical and mechanical studies on autoclaved products.
2. Effect of lime, fly ash, and silica as replacements for cement in 2- x 2- x 10-in. bars vibrated in gang molds.
3. Effect of duration and pressure of autoclave treatment on 2- x 2- x 10-in. bars vibrated in gang molds.
4. Strength and volume change studies on 8- x 8- x 10-in. block.
5. Lightweight or air void products.

The first phase was written up by Dr. George L. Kalousek in the January, 1954, issue of the Journal of the American Concrete Institute as "Studies on the Cementitious Phases of Autoclaved Concrete Products made of Different Raw Materials." Among other things, Dr. Kalousek showed that cement and lime-sand mixes when autoclaved, gave similar strengths, varying with the density (about the fourth power of density).

The present article will be limited to the second phase; i.e., an evaluation of results of bending and modified cube (compression) breaks on 2- x 2- x 10-in. bars of vibrated hand placed concrete in which cement was replaced with various percentages of lime, fly ash and silica flour and autoclaved 8 hr. at a full 125 p.s.i. Bars were first broken in flexure, then in compression.

The studies to date have only scratched the surface, and cannot be applied directly to any given product because of the large number of variables in raw materials and processing. However, they are intended to point the way to potential improvements in quality and reductions in cost, and to serve as a guide to further studies to pin point the proportions and steaming conditions for a given plant.

The strength results of the bars made with sand in 1952 are presented in Figs. 1 to 7 and made with expanded slag in 1951 in Table I. Since there were many points at which discrepancies could creep in and since there were a number of erratic results which could not be fitted into any curve, the values given should be used with caution. Not all of the data on which the observations below are based have been included in this abbreviated report. However, with this warning the following observations may be made.

1952-53 Series, Sand and Cinders

1. With sand, a relatively pure form of silica as aggregate, silica flour was generally more effective than fly ash when used as a replacement for cement to increase the strength.

2. With sand and silica flour, replacement of one-half of the cement remaining with an equal weight of quick-lime (or its equivalent in hydrated lime) still further improved the strength.

3. Of all the bars made, those in which a blend of 30 percent lime (as quick lime) 30 percent cement and 40 percent silica was mixed with four times its weight of sand, gave the highest compressive strength at 2 and

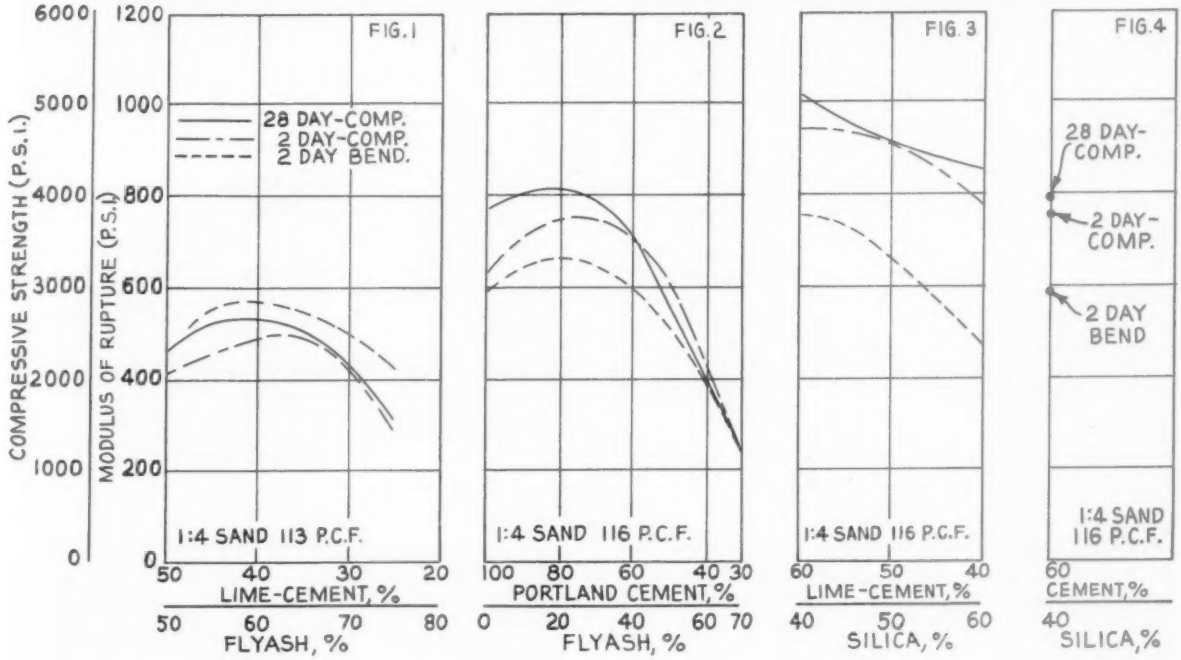
(Continued on page 146)

Table I: Autoclaved Lime, Cement, Fly Ash, Expanded Slag Concrete
Sample Values for 2- x 2- x 10-in. bars cast on vibrating table. All proportions by weight
1951 Series

Cementitious Material				Aggregates			Mix by Weight		Strength of 2x2" Bars	
No.	Cement	Lime As CaO	Fly Ash	Total	Slag Fines	Slag Fines 75% Coarse 25%	Fly Ash as Cementitious	Fly Ash as Aggregate	Transverse	Modified Compress-
1	100			100		400	1:4	1:4	298 p.s.i.	1073 p.s.i.
2		25	75	100		400	1:4	1:19	241	904
3		33	67	100		400	1:4	1:14	242	910
4		40	60	100		400	1:4	1:11.5	234	770
5		50	50	100		400	1:4	1:9	132	340
6		50	75	125		400	1:3.2	1:9.5	212	850
7		50	100	150		400	1:2.67	1:10	342	1160
8		50	150	200		400	1:2	1:11	423	1420
9	20	20	60	100		400	1:4	1:11.5	315	1245
10	50		50	100		400	1:4	1:9	424	1743
11	50		50	100	300		1:3	1:7	680	3000
12	33	20	47	100	300		1:3	1:6.3	615	2480
13	33	17	50	100	300		1:3	1:7	570	2460
14	33	13	54	100	300		1:3	1:7.7	740	2520
15	33	10	57	100	300		1:3	1:8.3	530	2390

RELATION OF FORMULATION TO STRENGTH AND UNIT WEIGHT OF HIGH PRESSURE STEAM CURED CONCRETE

Results of transverse and modified cube compressive strength. Determinations on 2- x 2- x 10-in. bars of hand placed vibrated semi-dry sand mortars cast 24 hours before autoclaving



GROUP A: CEMENTITIOUS FORMULATION VARIABLE; SAND CONSTANT

Autoclaved Cycle Constant: 8 hours at full 125 p.s.i.

Sand Constant at 80 percent of Total Dry Weight

Combined Cementitious Materials: 20 percent of Total Dry Weight

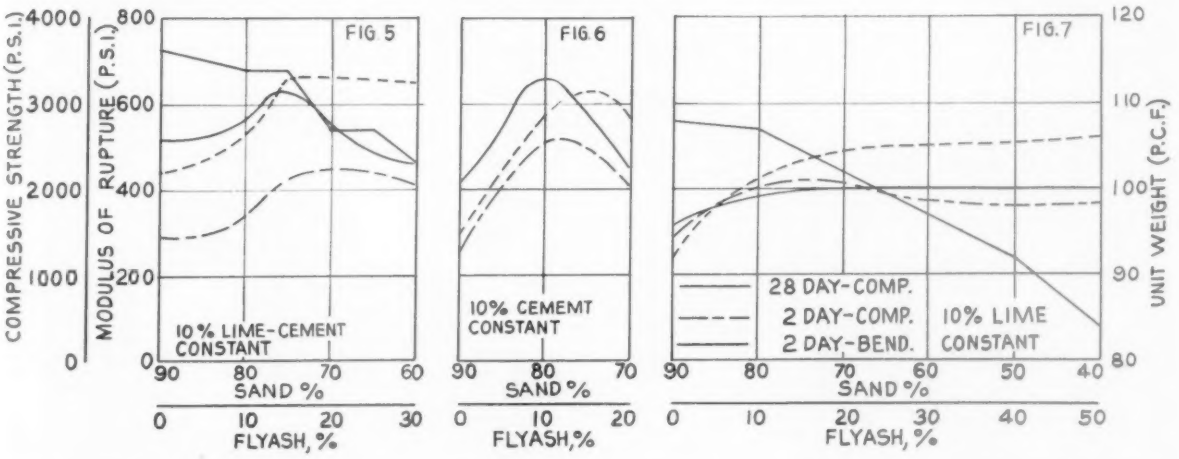
Fly Ash and Silica Considered as Cementitious Materials

All percentages based on cementitious portion only

All lime-cement mixes are based on equal weights of cement and quick lime. Only combined weights are shown. Actual mixes were made with hydrate of adjusted proportions. Unit weights are average for the series

All strengths (which varied less than 4 percent) were adjusted to average weight inversely to square of unit weight. (See text)

N.B. Smooth curves are for one particular set of materials and conditions only and are not necessarily applicable to other materials and conditions. Machine made block generally develop higher net area strengths than hand made bars



GROUP B: FLY ASH AS REPLACEMENT FOR SAND; PERCENTAGE REPLACEMENT VARIABLE

Autoclave Cycle Constant: 8 Hours at Full 125 p.s.i.

Fly Ash and Sand Constant at 90 percent of Total Dry Weight

Lime-Cement, Cement, or Lime Constant at 10 percent of Total Dry Weight

Fly Ash classed as an Aggregate

All Percentages Based on Total Dry Weight of Materials

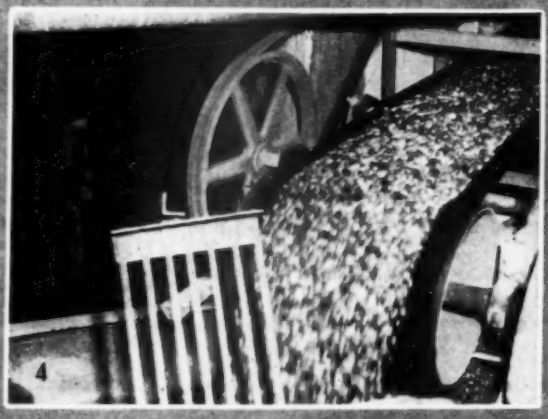
Lime Proportions Based on Quick Lime. Lab bars made with adjusted weights of hydrate

Unit weight shown as a variable in Figs. 5 and 7. Strengths not adjusted

All strengths in Fig. 6 adjusted to average weight inversely to square of individual weight. (See text)

N.B. Smooth curves are for one particular set of materials and conditions only and are not necessarily applicable to other materials and conditions. Block develop higher net area strengths than hand made bars

Views of Frank J. Knight Co. Plant



Views of ready-mixed concrete plant operations: (1) Mixer trucks in line for loading at plant, dispatcher's office in center; (2) a 31-ton gravel truck-train unloading into receiving pit over belt conveyor in reclaiming tunnel; (3) crane stockpiling stone from railway car; (4) belt conveyor in reclaiming tunnel unloading into central hopper with main belt to plant, to the left; (5) operator in reclaiming tunnel loading sand from stockpile onto belt conveyor; (6) Ernest McMahon, dispatcher at his busy desk

Batching operator standing beside 5½-cu. yd. weigh hopper, scales and control panel

PUSH-BUTTON Ready-Mixed Concrete Plant

Frank J. Knight Co., Centerline, Mich., handles aggregates, cement, water, and calcium chloride with electrical controls

By HUBERT C. PERSONS*

SO AUTOMATIC are the ready-mixed concrete operations of the Frank J. Knight Co. at Centerline, Mich., that it might be called a push-button plant. Maximum use is being made of modern conveyor equipment in this plant which was designed by Cyril J. Burke, Inc., of Detroit, and placed in operation in October, 1951. The company now operates 30 trucks and deliveries frequently exceed 6000 cu. yd. of concrete per week. During 1952 this company used 240,000 bbl. of portland cement. A second ready-mixed concrete plant, known as the Greenfield yard, is operated by the Knight Co. in Detroit, however, the operations and equipment described here are all at the Centerline plant in a Detroit suburb.

Cement Handling

Cement comes to the plant in bulk trucks. Electrically-operated screw conveyors, equipped with automatic shut-off valves, take the cement from the trucks to the bucket elevators which carry it to one of the four cement bins. These bins have a combined capacity of 1800 bbl. The cement conveyor system can handle 650 bbl. per hour. Two bulk trucks can be unloaded at the same time. A Dr-Vries dust collector at the cement unloading point helps to keep the area clean and saves 1½ bbl. of cement each day.

Some of the sand and coarse aggregate is hauled to the plant by the company's own 31-ton Autocar diesel trucks, although most comes by rail. Railroad cars are unloaded into sand and stone pits from which conveyors transfer directly to the bins. Pit excess is stockpiled over reclaiming tunnel conveyors by a 1½-cu. yd. crane. The plant has storage capacity for 25,000-tons of aggregates.

Reclaiming Tunnels

Aggregates received by gravel train are unloaded into a receiving pit directly over a belt conveyor. There are 1140 ft. of Thermoid conveyor belts operated in reclaiming tunnels under the aggregate stockpiles. These concrete lined tunnels are fully lighted, well-ventilated and kept dry by a battery of sump pumps which operate automatically when needed. The main conveyor to the batching tower is 175 ft. long with an 18 deg. incline to the tower. Aggregate bins are divided into three compartments, each with 100 tons capacity. Conveyors to the batching plant can handle 250 tons of material per hour.

Accurate electrical controls on both the cement and the aggregate weighing hoppers insure uniform proportioning of concrete according to customer requirements. Even the liquid calcium chloride used during cold weather operations, is dispensed electrically from a 2000-gal. storage tank.

Water for winter mixing is heated to 180 deg. F. by a coal-fired boiler. A Jaeger 65-lb. centrifugal pump takes the water from a 2500-gal. storage tank as needed. A check of the moisture content of the sand aggregate is made by the batch man three times a day.

Dispatcher's Office

The dispatcher's office, located close to the batching plant, is a vital point in the operations of the Knight plant. A chief dispatcher and an assistant issue orders to the batch man and keep careful records of the quantity and kind of concrete carried by each truck and the time each truck leaves the plant.

(Continued on page 159)

*Industrial public relations consultant, Chicago, Ill., for many years manager, Public Relations Bureau, Portland Cement Association.

Autoclave Tests

(Continued from page 142)

28 days, the highest bending strengths, the lightest color and the most economical mix in terms of strength or thousands of p.s.i. per dollar (calculated as explained in 11 below).

4. While lime as a partial replacement for cement appeared to benefit sand-silica bars, and possibly cinder fly ash bars, it reduced the strength of sand-fly ash bars.

5. Straight lime-fly ash sand mixes with no cement, reduced both strength and densities and appeared to be more suitable for mixes placed under pressure as in brick presses to increase the density, or for very lean mixes rather than for ordinary block mixes.

6. Increasing fly ash replacement for sand tended to decrease density, high fly ash contents become sticky and hard to finish.

7. In cinder and expanded slag mixes, fly ash gave practically as good results as silica, especially when, taking advantage of its low cost, a little extra fly ash was used.

8. In general, autoclaving did more for the lean than for the rich mixes in the straight cement-sand bars.

9. Practically all autoclaved sand bars showed small or large increases in strength between 2 and 28 days. The loss of a few percent by a few bars was well within the limits of experimental error.

10. Dry by-product lime hydrate gave about 10 to 15 percent lower strengths in the 50 percent cement mixes than commercial hydrate on equal weight basis, and also a darker color.

11. Based on $15 a ton cement and quick lime, $10 a ton silica flour, and $2.50 a ton fly ash, the following sand bars gave substantially the same efficiency in compression p.s.i. per dollar (cost index based on arbitrary assumption 1 percent=⅛ ton, cost of sand neglected).

Percent Cement	Percent Lime	Percent Fly Ash	Percent Silica	Percent Sand	Unit Weight	2-Day M. R.	28-Day Comp.	Cost Index
3	3	14		80	112	490	2140	25
3.5	3.5	13		80	110	550	2420	27.5
5	5	10+5=15		75	114	665	3150	35
12		8		80	115	570	3500	40
5	5		10	80	112	620	4230	50
6	6		8	80	117	750	5040	52

1951-52 Expanded Slag Series*

12. Autoclaved specimens with 1 part of lime-fly ash mixture to 4 parts by weight of expanded slag with no portland cement at all increased in strength as the lime-fly ash ratio decreased from 1:1 down to 1:2 and even 1:3. The 1:3 ratio is 1 part lime as CaO to 19 parts by weight of slag plus fly ash. Since fly ash costs less than slag it is grouped with the aggregates.

13. It appears that either lime or cement, when mixed in the same proportions to combined weights of fly ash plus slag and given the same autoclaving treatment, will give substantially the same strengths. However, the lime mix will require a higher fly ash to slag ratio.

14. Autoclaved expanded slag-concrete products gave poor results where none of the cement was replaced with siliceous fines.

15. While no direct comparison was made with lime, 1:3 cement expanded slag mixes gave as good results when made with fly ash as they did with silica flour for a cement replacement.

16. Flexural strengths with center loading averaged 28 percent of the modified compression tests made on the broken halves of the bars. The results noted in 1 to 6, above, apply for both compressive and flexural values in expanded slag bars. Bending strengths have been included as more directly indicative of resistance to cracking.

See Table I for tabulated results of tests on Lime, Fly Ash, and Silica Flour as replacement for portland cement in expanded slag bars.†

*Taken from previous report to National Lime Association

†N.B. Results with handmade semi-dry bars may not correlate too well with dry machine-made block.

New Products Association

CONCRETE PRODUCTS PRODUCERS throughout the State of Minnesota met recently in Minneapolis for the purpose of organizing the Minnesota Concrete Products Association. About 100 representatives were in attendance.

The stated purposes of the new organization are to set up and maintain higher standards of advertising and better quality of material; to acquaint the public with the many uses for masonry units, such as warmth, thrift, fire safety and durability; and to build a closer relationship between the various producers in the state.

Guest speakers at the meeting included R. E. Copeland, National Concrete Masonry Association; Merrill Allen, South Dakota Concrete Products Association; Ray Minnette, Wisconsin Concrete Products Association; and V. J. Meyers, Portland Cement Association.

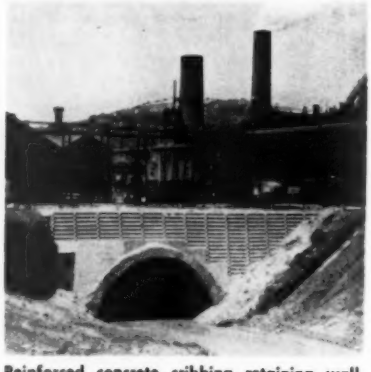
The first officers elected to serve the association are as follows: Wm. J. Brull, Northwest Concrete Products Co., St. Cloud, president; C. J. Goodman, Goodman Concrete Products, Bemidji, first vice-president; T. M. Seppi, Seppi Bros. Concrete, Virginia, second vice-president; D. E. Erickson, Glacier Sand & Gravel, Minneapolis, secretary; and W. J. Molin, Molin Concrete Products, St. Paul, treasurer. The following directors were also elected: G. J. Saffert, American Art Stone Co., New Ulm; H. A. Benson, Benson Concrete Block Co., Marshall; S. G. Dickinson, Central Building Supply, St. Paul; R. A. Anderson, Crown Sidewalk and Block Co., Minneapolis; H. P. Joswick, East End Coal & Cement, Winona; H. C. Lampy, Fergus Concrete Products Co., Fergus Falls; and R. C. Hemmingway, Hemmingway Concrete Products Co., Albert Lea.

Lightweight Aggregate Specifications

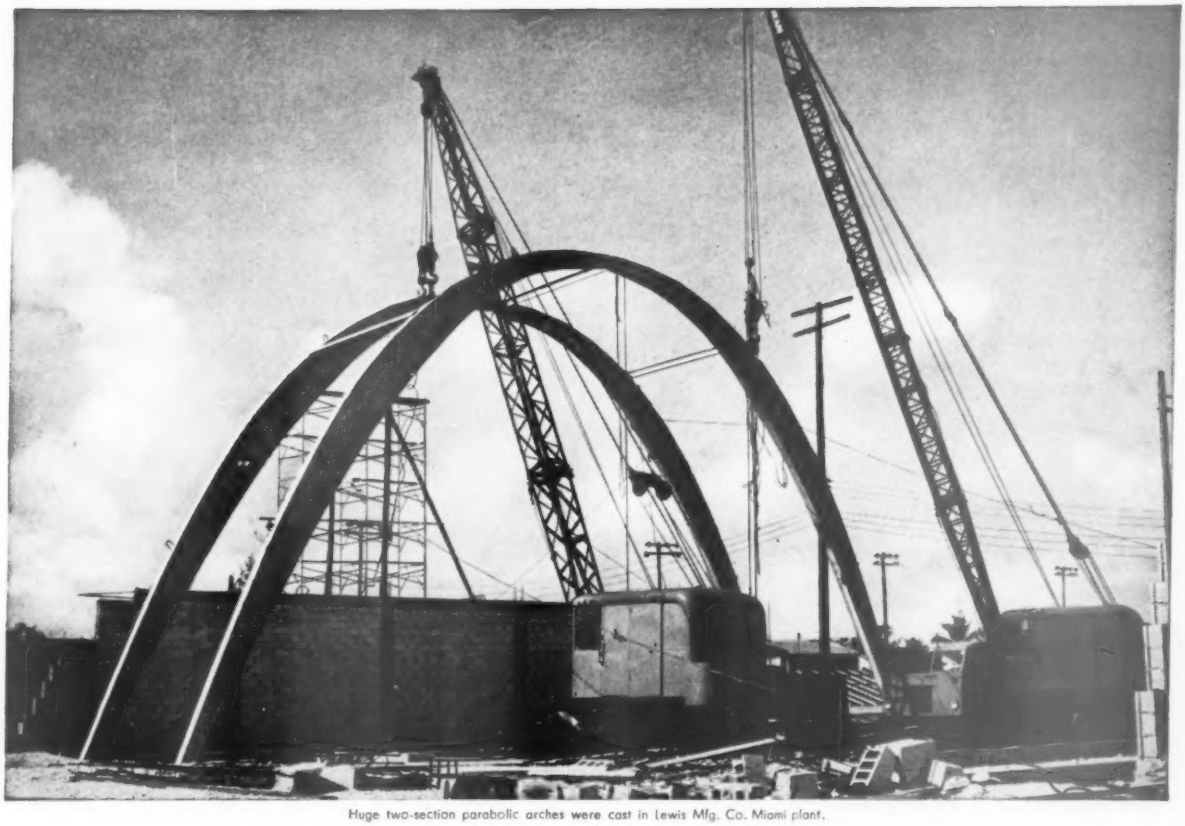
AS RECENTLY REPORTED in the *NCMA Reporter*, publication of the National Concrete Masonry Association, A.S.T.M. committee C-9 on concrete and concrete aggregates has approved new tentative specifications for lightweight aggregates for concrete masonry units. The specifications impose requirements on the aggregate as to grading, unit weight and deleterious substances, in addition to requirements regarding such properties as drying shrinkage and surface pop-outs. Methods of sampling and testing, including tests for staining and popping, are given in the specifications.

Concrete Pavement Promotion

THE PORTLAND CEMENT ASSOCIATION, as a part of its promotional program, recently issued a pamphlet on concrete pavement, illustrating and describing the durability and long life of heavily traveled concrete pavement installations over various parts of the country. Most of the concrete roads illustrated were built in the early 1900's, have withstood heavy traffic throughout the years, and are still giving service today. In addition to long life and durability, the pamphlet points out other advantages of concrete pavement, including moderate initial cost of installation, lower maintenance costs, and such safety features as improved visibility and more skid-resistance.



Reinforced concrete cribbing retaining wall, shown above, was manufactured by Universal Concrete Pipe Co., Columbus, Ohio, and installed at U. S. Steel Corp's Clairton Works. Keyed to the concrete arch over Peters Creek, it secures valuable land for construction



Huge two-section parabolic arches were cast in Lewis Mfg. Co. Miami plant.

OPPORTUNITIES UNLIMITED

FOR THE CONCRETE PRODUCTS MANUFACTURER

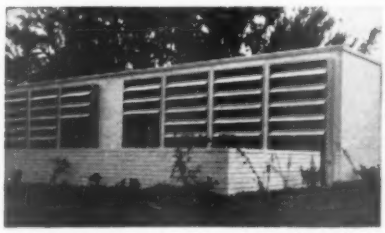
Opportunities today are unlimited for the resourceful manufacturer of concrete products. Lewis Manufacturing Company of Miami, Florida has developed a ready market for precast window and door frames, posts and rails, bench ends, wall panels and beams. A few of these newer applications of precast concrete are illustrated. Others, no doubt, have occurred to you.

For all of its concrete products, special or standard, Lewis Manufacturing Company finds that "with Lehigh Early Strength Cement and live steam curing, molds of some sizes can be re-used as many as five times in a 16-hour working day . . . faster curing saves storage space, eliminates considerable breakage and enables us to give better and faster service to our customers."

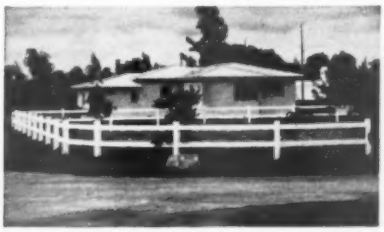
Try Lehigh Early Strength Cement in your own plant and compare the results with those you are getting now.

LEHIGH PORTLAND CEMENT COMPANY

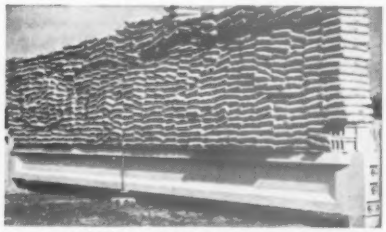
ALLENTOWN, PA.



Large precast concrete window frames in this school achieve a striking shadow-box effect.



Precast concrete fence posts and rails offer many sales opportunities.

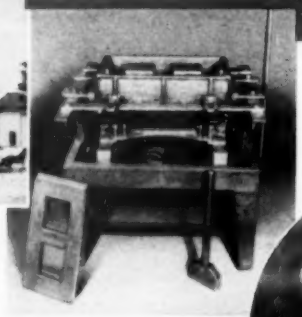


Prestressed 49' 2" beam withstands a test load of 633 bags of Lehigh Early Strength Cement.

LEHIGH PORTLAND CEMENT • LEHIGH EARLY STRENGTH CEMENT • LEHIGH AIR-ENTRAINING CEMENTS • LEHIGH MORTAR CEMENT

BESSER GOLDEN JUBILEE..

BESSER started here ⬅ making concrete block machines like this ➡



Progress from 1904 to 1954

has developed this modern BESSER Plant ➡

The Concrete Block Industry and Besser have advanced far during these 50 years of teamwork in concrete block engineering and production. Starting in 1904, Besser led the industry as it "became of age" and reached a production record of 600-million block in 1925. Sound progress continued and by 1953 the Industry's production totalled almost 2-billion units. The present trend indicates increases to 6-billion-block annual production in the near future. For years to come, prospects for progress look *good!*

Herman Besser, Founder of Besser Manufacturing Company

In this year of BESSER'S GOLDEN ANNIVERSARY, over 800 people work in this plant

Today BESSER is the world's leading manufacturer of concrete block machinery

In the Besser files is a letter written Jan. 18, 1924, by a typical two-machine Besser plant operator, predicting *then* that "we are only at the beginning of a great demand for concrete block". How *right* he was . . . and today you can say *that* again, with still more emphasis! Architects, contractors, realtors, building and home owners at all levels have responded to Besser leadership. More and more Besser-made concrete block are being used for exteriors and interiors of all types of buildings and homes.

Jesse H. Besser, son of Founder, and President

Constructive cooperation has won genuine respect for concrete block masonry!

Besser Vibrapac block-making techniques . . . speedy automatic mass-production machines . . . continuous scientific research . . . modular sizes . . . modern ashler pattern units . . . colorful split-block beauty and many other outstanding Besser developments have gained universal acceptance for concrete masonry. Besser thanks you . . . and pledges continued development in automatic concrete block machinery to match your advance through the future.

. . . a Half Century of Concrete Masonry Progress

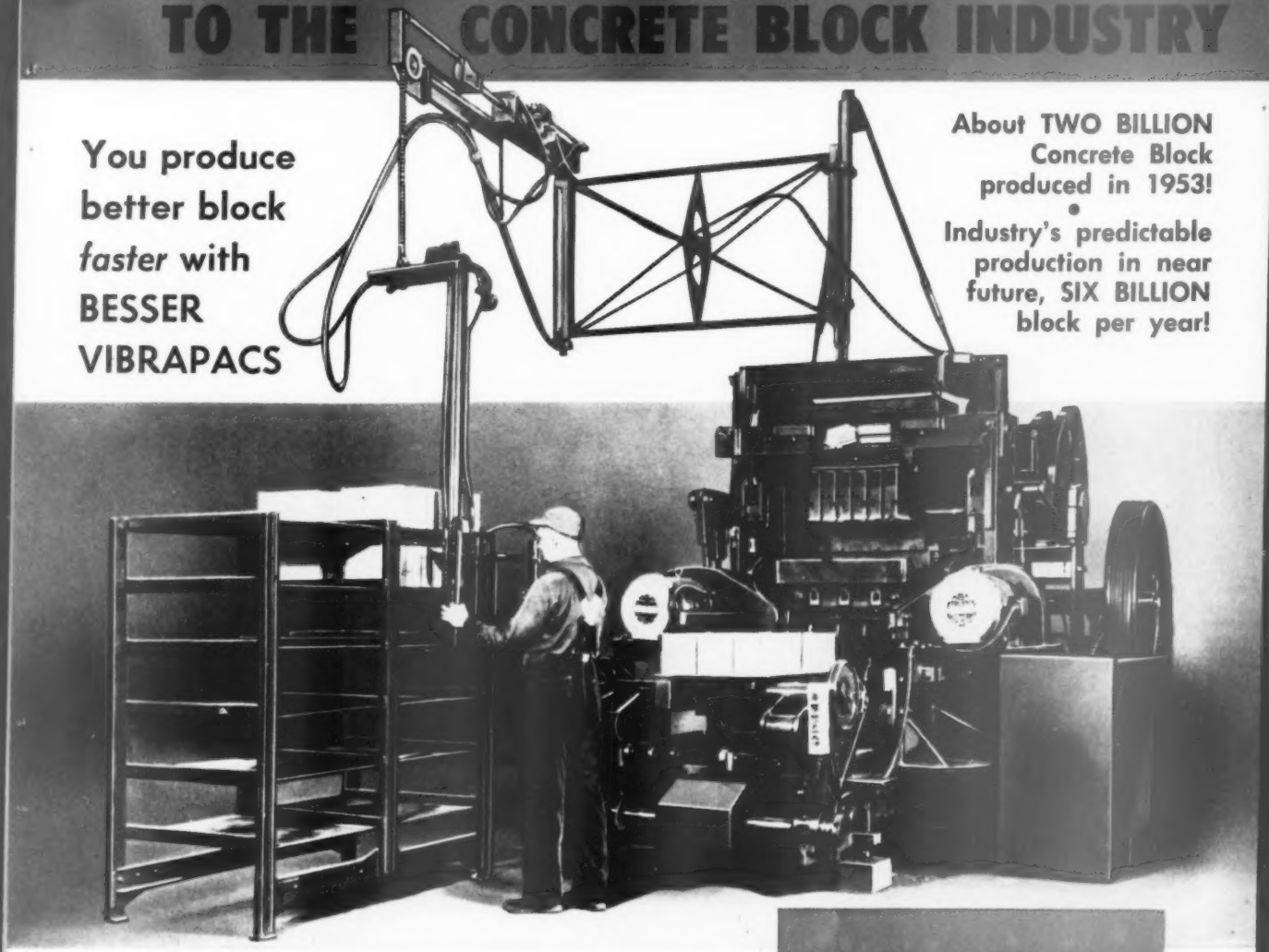
50 YEARS OF COOPERATIVE SERVICE TO THE CONCRETE BLOCK INDUSTRY

You produce better block *faster* with BESSER VIBRAPACS

About TWO BILLION Concrete Block produced in 1953!

•

Industry's predictable production in near future, SIX BILLION block per year!



Your future looks better with BESSER

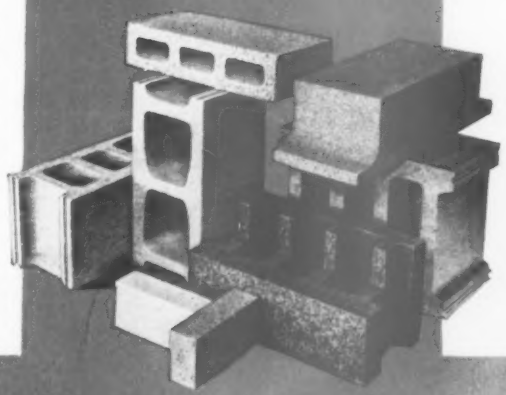
Many letters from operators of Besser-equipped plants have recorded genuine satisfaction with Besser machines. Letters like this one, for instance: **"I have inspected hundreds of plants and am familiar with all makes of concrete block machinery. I have found nothing that can equal BESSERS for quality and quantity production".**

Similar letters through the years have expressed approval: **"Besser Vibrapacs give us maximum production at low operating cost" . . . "We never have any downtime, now that we have Vibrapacs" . . . "Our experience with Vibrapacs is very gratifying—we are making money" . . . "We firmly believe Besser Concrete Block Equipment is still the finest available" . . . "The Vibrapac is the only money-maker in the concrete block business" . . . "Besser equipment is dependable and has given us full satisfaction".** That just about sums up the reasons for the growth of Besser-equipped plants through a half century of concrete masonry progress.

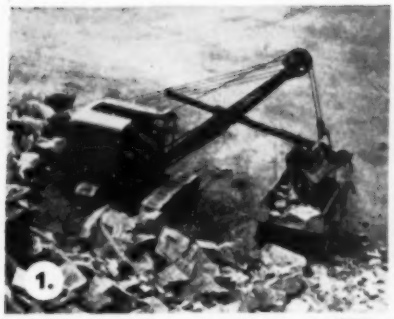
Today your markets are greater than ever before for the many styles and sizes of concrete masonry units you can make on BESSER Vibrapacs, using ONE SET of PLAIN PALLETS. Greater power, smoothness and ruggedness, and more profitable productive capacity have been engineered into BESSER equipment. Get on the "Besser Team" and win!

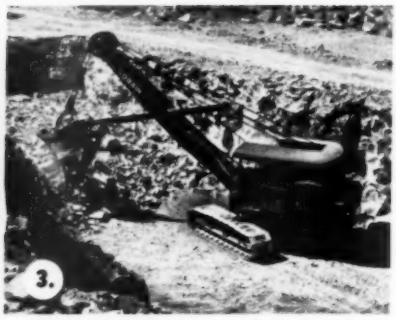
Popular MODULAR Sizes

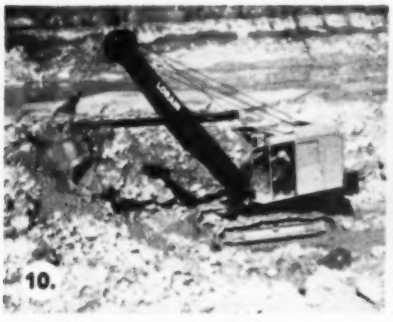
Besser Modular Concrete Block in all sizes and shapes (including modern Soffit block for floors and roofs) can be made on the BESSER Vibrapac . . . faster, better, automatically, at low cost! Modular sizes are welcomed by architects and builders. Practical for you, too, in production and selling. Complete details on request.



BESSER MANUFACTURING COMPANY • Alpena, Michigan, U. S. A.







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More and more quarries select the Lorain-50 as the best shovel in the 1-yd. class for rock work. Here are a few of them. Operating speed and ease, the shock-cushioning action and "no-engine stall" of the hydraulic coupling, plus the ability of the Lorain-50 to stand up in tough rock digging . . . these are some of the reasons for this preference. When so many owners all over the country agree on the same rock shovel, there must be good reason . . . find out why!

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   Devon, Penna.
2. **CATSKILL MOUNTAIN STONE CO.**
   White Plains, N. Y.
3. **FOSTER, ALDER & WRIGHT QUARRY**
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6. **BILBREY LIMESTONE CO.**
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   Charleston, W. Va.
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12. **VALLEY VIEW LIME CO.**
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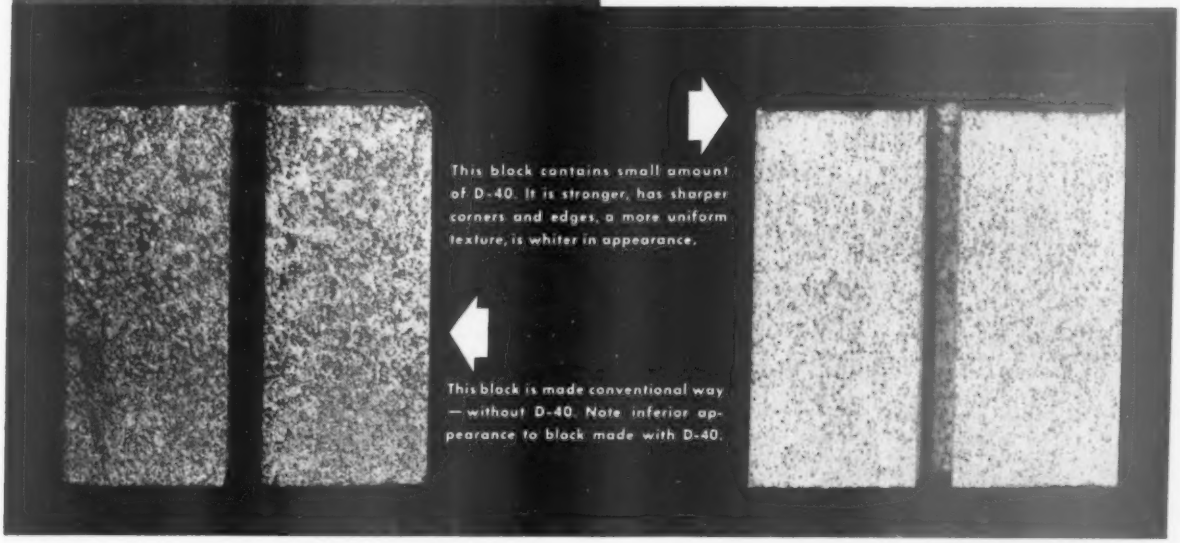
THE THEW SHOVEL CO., LORAIN, OHIO

BETTER concrete blocks at lower operating costs

with low-cost D-40


This block contains small amount of D-40. It is stronger, has sharper corners and edges, a more uniform texture, is whiter in appearance.
This block is made conventional way — without D-40. Note inferior appearance to block made with D-40.

Reduced abrasive wear on mixing and molding equipment
Mixes pour into molds faster, "break" cleaner—saves time
Closer bonding—saves on painting and waterproofing

Let us show you how we have helped other concrete product manufacturers make superior blocks and at the same time reduce their operating costs.

Oronite's ready-to-use additive, D-40, is economical and easy to use. Only one to two ounces is needed per bag of cement. Just add to dry cement at the mixer.

For complete information, sample and technical help, write or call the Oronite office nearest you.

ORONITE CHEMICAL COMPANY

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ORONITE CHEMICAL COMPANY

The Story of the Ready-Mixed Concrete Industry

20. A producer views the ready-mixed concrete business . . .

By JAS. A. NICHOLSON*

OLD TIMERS REMEMBER well the story of the founding and development of The National Ready Mixed Concrete Association. Percentage wise, old timers represent a very small segment of this industry. Undoubtedly, over half of the present members know practically nothing of the Association's early history. In my own case, I remember wondering why joint convention sessions were always held with The National Sand and Gravel Association and never with The National Crushed Stone Association. The answer was and is an easy one. Sand and gravel producers, in convention assembled, started the ready mixed concrete organization.

In the late 20's, the eyes of cement men and aggregate producers were focused on the efforts of the ready-mixed concrete pioneers. Metropolitan aggregate producers were rather frantically trying to decide whether to get in or stay out. Trade magazines were full of articles discussing the possibilities of ready mixed concrete. The great interest hit the 13th Annual Convention of The National Sand and Gravel Association like a bombshell. The outstanding feature of the 1929 Cleveland meeting was the tremendous attention paid to the new, budding phenomenon—ready mixed concrete. The peak of good times had been reached, building construction was showing signs of fatigue and a recession was feared. Producers were in the frame of mind to give their full attention to the enthusiastic speakers.

The leading paper on ready mixed concrete was delivered by Norman Boggs of The Portland Cement Association. Other papers, dealing with the popular subject were handled by Alex Dann, Alex Foster, Jr., Stephen Stepanian, A. A. Levison and J. E. Burke. The latter, in the following year, was to become the first president of a new country-wide organization, The National Ready Mixed Concrete Association.

Mr. Boggs' paper covered the field. He highlighted the phenomenal growth of the new industry, and talked about plants, site selection, capacities, layouts, construction and operation. He discussed truck body developments. He handled maintenance problems. He told about tests on hauled concrete. He stressed consideration of quality. He faced the problem of customer relations and suggested proper bases for a pricing program. He submitted plant and delivery cost figures covering original investment and operations. His final sentence was in these words, "Where a high quality of product is maintained, a fair price is charged, and an effort is made to give efficient service, there is every indication that the business will continue to grow." The continued, far reaching expansion of the ready mixed concrete industry during the following 20 years more than fulfilled the speaker's prophetic utterance.

Alex W. Dann, of The Keystone Sand and Supply Co., Pittsburgh, told why sand and gravel people were so vitally interested in the possibilities of ready mixed concrete. He succinctly stated three compelling reasons why aggregate producers should get into the new business:

1. Availability of supplies of raw materials.

2. The usual possession of property and equipment advantageously located for the delivery of this material.

3. The fact that trucks used for the delivery of concrete may be used interchangeably for the delivery of aggregates themselves.

Sand and gravel producers in attendance at the convention were saying to one another, they had to go into the concrete business in order to control the delivery and the end use of their products.

Alex Foster Jr. talked about the Warner Company's Philadelphia operations. He discussed plant and delivery equipment. He made a number of interesting comments on selling prices and service. His remarks on prices were to the effect that the profit per ton on sand and gravel used in concrete should be at least twice the gross margin obtained from the sales of these commodities when delivered in bulk. As previously pointed out, consideration of this price determining formula can easily be used as a foundation for a sales policy in today's markets.

Alex Foster poignantly observed that ready mixed concrete cannot be sold to everyone. The pioneers had already discovered that some contractors do not handle concrete in a manner that assures the best results in completed structures. He wisely recommended that ready-mixed concrete companies employ "trouble men" to make sure that customers learn to properly handle the new product.

Stephen Stepanian, Arrow Sand and Gravel Co., Columbus, Ohio, reminisced over his efforts 13 years previously, in trying to obtain a truck mixer patent and described problems that developed out of building the first truck mixer. In his talk, he outlined the economic advantages accruing to a customer through the use of ready mixed concrete. He listed 12 cost items on which the contractor could make substantial savings by buying ready mixed concrete.

A. A. Levison, Blaw Knox Co., (whose 1943 Pit & Quarry articles on Plant and Truck Mixer Maintenance are still widely quoted) with the use of slides, described a number of typical ready mixed concrete plant installations. He mentioned that Jones Gravity truck bodies were being used in Washington, D. C. He showed other slides demonstrating agitating dump trucks being used at Graham Bros. operations in Richmond. He confessed to the producers that these units were being manufactured and distributed by Blaw-Knox.

In the final Cleveland paper on ready mixed concrete, J. E. Burke, Ready Mixed Concrete Co., Pittsburgh, spoke of controlling strength, pricing policies, delivery zones and sales efforts. He listed four basic requirements of a ready mixed truck:

1. A body that would eliminate segregation.

2. One that does not leak.

3. A truck of sufficient height so that the concrete would not splash over the top.

4. Body should be light weight and able to carry 3 cu. yd.

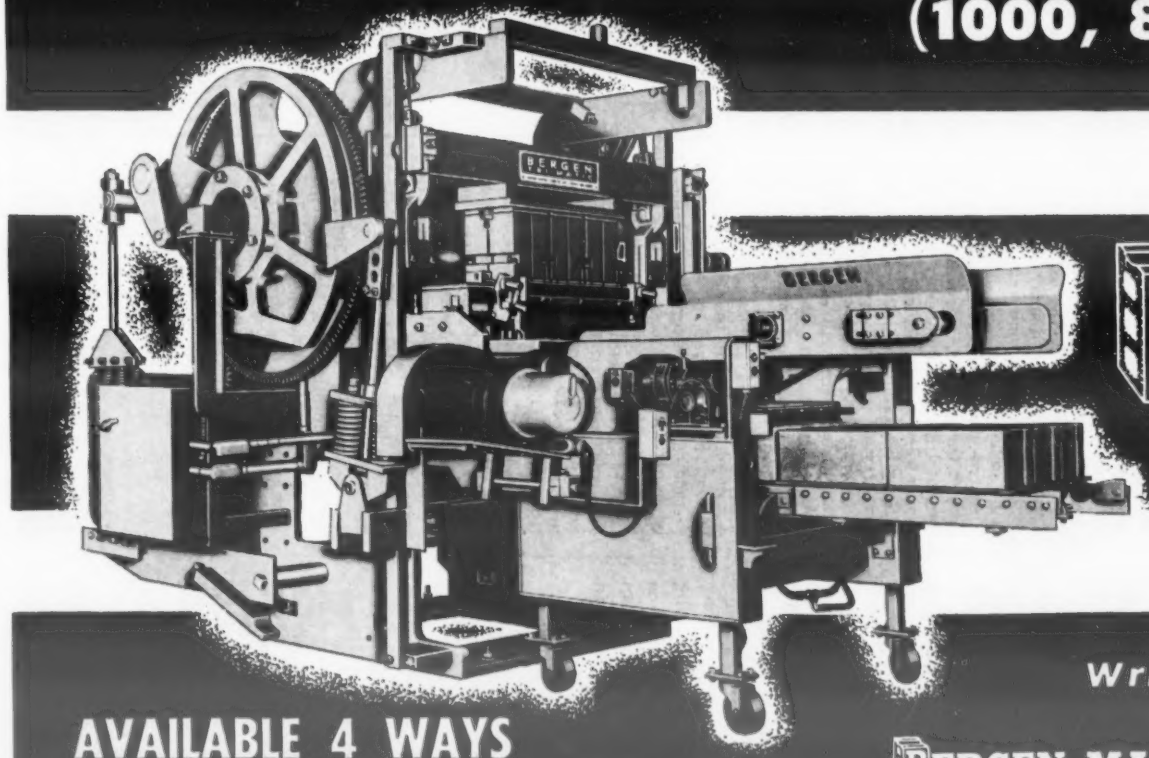
Interest in ready mixed concrete, fermenting in the Cleveland meeting, burst all over the 1930 convention held in Memphis, Tenn. The 14th convention entrusted the leadership of The National Sand and Gravel Association to Robert J. Potts, Waco, Texas. Even then, a nationally known figure, today a highly honored veteran of the building industry, T. S. Holden, vice-president of The F. W. Dodge Corporation, was a featured speaker. The honored guest of the convention was W. F. Wise, of Dallas, Texas, the president of the National Crushed Stone Association. Winners of the first safety contest were awarded trophies by Nathan C. Rockwood. Members were given the first report on the activities of the association's new laboratory. In many ways the Memphis meeting was a great convention, but the big story was ready-mixed concrete. Everybody was talking ready mix everywhere. Speeches were devoted to the subject as were discussions in the hotel rooms and on the lobby floor.

(Continued on page 154)

*Pres. Nicholson Concrete Co., Toledo, Ohio

MORE GOOD BLOCK PER HOUR

(1000, 8" EQUIVALENT)



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Made by Williams, this is the broadest selection of fine Cement and Mortar colors on the market. By offering your customers a choice of 23 shades, you can quickly and easily settle upon one having the exact chemical and physical properties your color specification requires.

CEMENT COLORS BY WILLIAMS

Here you have a choice of 18 shades —6 Reds, 3 Greens, 3 Browns, 3 Yellows, 1 Black, 1 Blue, and 1 Orange. Each shade is manufactured to meet the most exacting specifications for cement work—as recommended by the American Concrete Institute and the Portland Cement Association.

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Here you have a choice of 5 different shades — one shade in double strength red, light buff, dark buff, chocolate and black. Each of these colors may be used with excellent results with any standard mortar mix or with a ready-made Bricklayer's Cement.

Write today for color samples and complete technical information on how Williams Cement and Mortar Colors give you superior results. Address Dept. 10, C. K. Williams & Co., Easton, Pennsylvania.

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C. K. WILLIAMS & CO.
East St. Louis, Ill. Easton, Pa. Emeryville, Cal.

First Ready-Mix Exhibit

(Continued from page 152)

The machinery exhibit was no exception.

In the Blaw-Knox Co. exhibit, the "Stepanian" truck mixer was featured. C. O. Bartlett and Snow Co., of Cleveland, displayed a panel of photographs showing the transportation of concrete in their movable "V" bodies. The Highway Truck Mixer Co., also of Cleveland, showed moving pictures of a truck mixer in action. Representatives of this manufacturer were busy taking convention delegates out to Fischer Lime and Cement Co.'s plant to demonstrate the new unit.

At the Jaeger Machine Co. booth, Henry Fraas and his associates were kept busy handing out literature, describing The Jaeger Trail, a new self-dumping type truck that mixes concrete while in transit. Representatives of Transit Mixers Inc., San Francisco, proudly showed moving pictures of the sensational Paris transit mixer, operating in various types of construction work. For 1930, the exhibit was a good machinery display and undoubtedly concrete delivering equipment stole the show.

As one visited with fellow operators around the exhibits, in rooms and in the hotel lobby, a number of developments were clearly evident.

Even as early as 1930, producers were trying to get away from such specifications as a 1-2-4 mix, and were talking about strength concrete. The 3-cu. yd. plant mixer was already in use. Producers were planning how trucks and roads were going to be able to handle payloads exceeding the 3 cu. yd. to which they were then limited. Pricing systems comparable to today's thinking were being widely used. The time element was already recognized as a factor with delivered prices based on a zoned map. Job efficiency was being considered and where fast unloading practices prevailed, lower selling prices were being quoted. The big user of concrete was already being given preferential price and service. During winter months, a number of operators were already producing heated concrete. Actually a few of these producers were doing a better job on heating concrete than do some of today's operators.

The morning session of January 30th was devoted to a study of the ready mixed concrete industry. The first speaker was the Director of Engineering. His name, even then, was Stanton Walker. His topic was titled, "Ready Mixed Concrete." Stanton discussed the stability of the industry, the field for ready mixed concrete, size of the community (estimated 50,000 population) which could support an operation, location of plants, capacities of plants and required investment, selection of type of equipment, effect of transportation on quality and control of concrete quality. He completed the talk with a summary of his remarks.

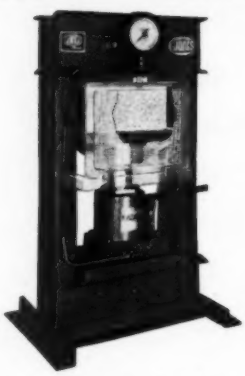
Few of those in attendance conjectured that the form of this first paper was to be the foundation of many such talks that Stanton would deliver annually throughout his many years of tremendous service to the industry.

Mr. Walker was followed to the speakers table by H. F. Thomson, who, at that time was president of General Material Co., St. Louis. Mr. Thomson's paper was titled "Some Characteristics of the Ready Mixed Concrete Industry." The paper was both interesting and challenging. The St. Louis pioneer who gave this second talk, was later to become president of The National Ready Mixed Concrete Association and The American Concrete Institute. He is the only one to be so singly honored. By odd circumstances, Harry is also the only "two-time" pioneer of our industry. In 1950, Harry became the driving force behind the ready-mixed concrete invasion of an isolated fortress, the great city of Chicago.

Following Mr. Thomson's talk, the whole subject was thrown open for discussion. Two early enthusiasts, J. L. Shiely of St. Paul and J. E. Burke of Pittsburgh acted as leaders. Mr. Burke stressed the great need for coordination of effort. He made the proposal that, pending further consideration of an independent organi-

(Continued on page 157)

***Jones* COMPRESSION TESTING MACHINE**



for more economical mixes, and uniformly higher strength

By doing your own testing of concrete blocks and cylinders, you will immediately discover anything which may have gone wrong with the aggregate, grading, mixing, etc. This will help you maintain more uniform quality and develop more economical mixes. The Jones (formerly Yoder) testing machine is low in first cost, specially designed for concrete products plants.

Send for list of satisfied users and literature.

***J. A. Jones* CONCRETE MACHINERY**
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CONCRETE PRODUCTS MACHINERY

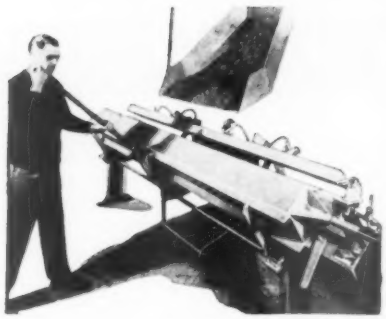
KENT Batch Mixers

Sturdy machines designed for large output with minimum operating and maintenance expense.

All steel construction with replaceable, hardened liners. Heavy duty cast mixing blades. Anti-friction bearings. Positive Conway clutch. V-Type Positive belt drive. Explosion proof motors. Cut Gearing. Self-cleaning discharge gate. Safety grid.

Capacities: 12, 18, 24, 30, 42 and 50 cu. ft.

Write for details and prices.



KENT Lintelators

produce better lintels and sills faster and more economically than by any other method, opening a new market for profitable sales. Units available for making various sizes.

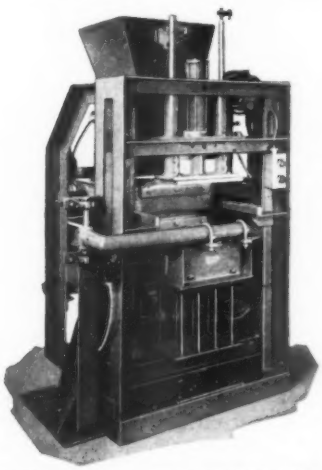
Builders really "go" for these lintels which simplify installation and harmonize with all concrete structures.

KENT Continuous Mixers

step up output, eliminate production problems, save labor and increase profits.

Fully automatic, the operator Sets it—Starts it and Leaves it to attend to other duties. Up to four aggregates can be fed with the proportion of each accurately controlled. Each is a versatile machine since the number of paddles, their angle and position on the shaft are all variable—also the cycle of mixing and length of time the aggregate is retained is variable up to 12 minutes.

Sizes available for various machines including the largest machines.

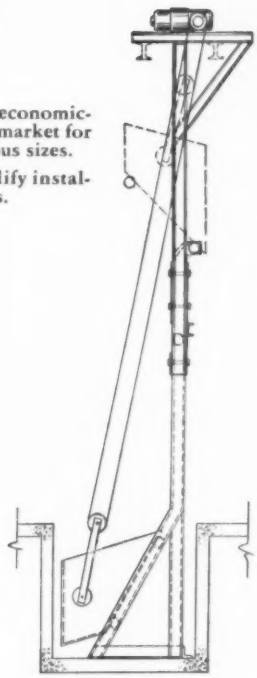


KENT Super BLOCKMAKER

A semi-automatic, push-button machine. One man operation. Combines vibration, agitation and pneumatic pressure to produce strong, smooth topped blocks.

Makes two 4" blocks, two 6" blocks, one 8" block; one 10" block or one 12" block each cycle.

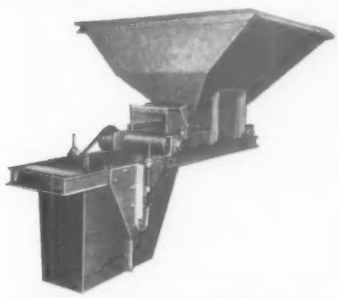
Uses cast iron or steel cored pallets.



KENT Skip Hoist

These hoists, in vertical or inclined type, are available in capacities of 12, 18, 30, 42 and 50 cu. ft.

The heavy duty geared head motor contains mechanism for adjusting the stop positions. Push a button—the skip rises and stops at the dumping position. Push another button and it lowers and stops at the loading position.



KENT Feeders, Elevators, Unloaders, etc.

Machines are available for unloading sand, crushed stone, gravel, aggregate, etc., from under gondola cars, from pits or bins and feeding this material to elevators.

Other elevators are available for delivering concrete from the mixer to bins on block machines, etc.

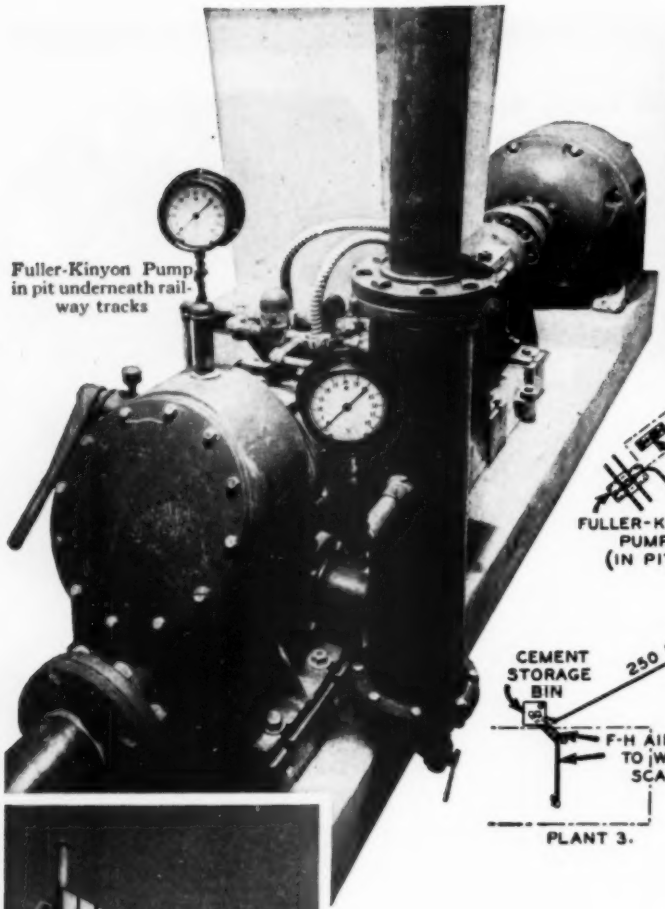
Literature Available Specifically Describing All Products

The **KENT MACHINE CO.** Cuyahoga Falls, Ohio

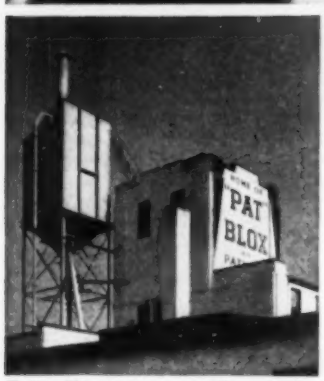
Manufacturers of **CONCRETE PRODUCTS MACHINERY** *Since 1925*

PAT BLOX gets fast • clean UNLOADING and DISTRIBUTION with the

FULLER-KINYON CONVEYING SYSTEM

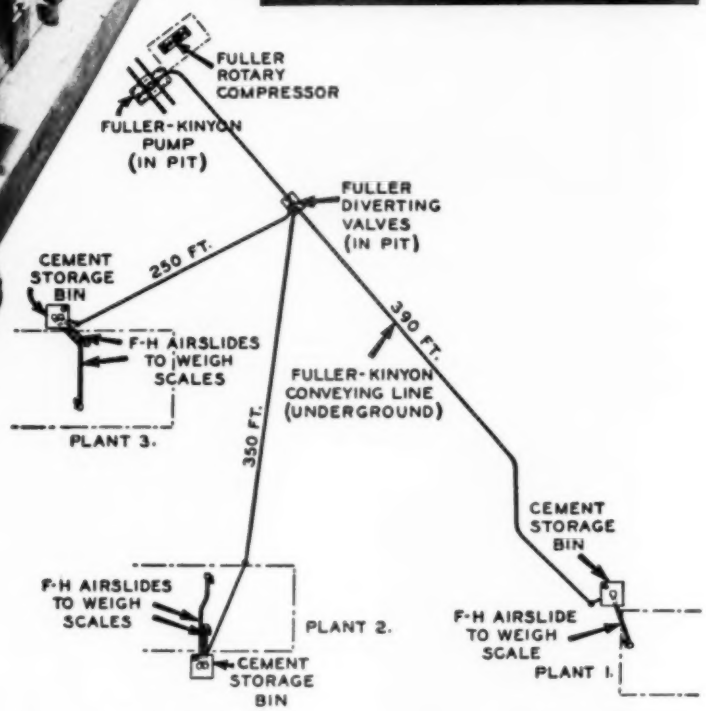


Fuller-Kinyon Pump in pit underneath railway tracks



Fuller-Kinyon transport line entering top of bin. One F-H Airslide from bin bottom to weigh-scale. (Plant 1 in plan)

Fuller-Kinyon transport line entering top of bin. Dual F-H Airslides from bin bottom to weigh-scales. (Plants 2 and 3 in plan)



This fast-growing, concrete-block plant, really three plants in one, solved its unloading and distributing problem with a Fuller-Kinyon Conveying System.

To avoid interference with trucking and other plant activities, incoming cement is pumped underground from hopper cars to three storage bins by a Fuller-Kinyon Pump with a 200-bbl. an hour capacity. Diverting valves in the conveying line regulate distribution from pump to bins. The conveying system operates on air furnished by a Fuller Rotary Compressor.

From the bins, F-H Airslides — equipped with airfeeders and air-operated, cut-off gates — convey the cement to weigh-scales over the mixers.

If unloading and distributing of dry, pulverized materials present a problem in your plant, a Fuller engineering study may quickly determine a more convenient, faster, more economical system. No obligation, of course.

Fuller

FULLER COMPANY, Catasauqua, Pa.
120 So. LaSalle St.—Chicago 3
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DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—
COMPRESSORS AND VACUUM PUMPS—
FEEDERS AND ASSOCIATED EQUIPMENT

P-139
1625

The Ready-Mix Story

(Continued from page 154)

zation, The Ready Mixed Concrete Division of The National Sand and Gravel Association be established.

In a follow up of this proposal, the Executive Committee was instructed to lay out a program whereby problems of the new industry could be studied and arrangements made for a clearing house of information. Producer members of the Executive Committee were Robert J. Potts, Waco, Texas; H. V. Owens, Utica, New York; H. S. Davison, Pittsburgh; H. N. Bottjes, Grand Rapids, Mich.; J. C. Buckbee, Chicago; Alex Foster, Jr. Philadelphia and F. W. Peck, Kansas City. Two staff members were also on this committee. They were Stanton Walker, director, Engineering and Research Division, and V. P. Ahearn executive secretary. The effect of the instructions was to tell Vince and Stanton to start running with the ball.

The members of the still infant industry were called together for a meeting in Chicago on May 16th, 1930. At this meeting the decision was reached that, "A real need exists for an organization of the industry throughout the United States and Canada."

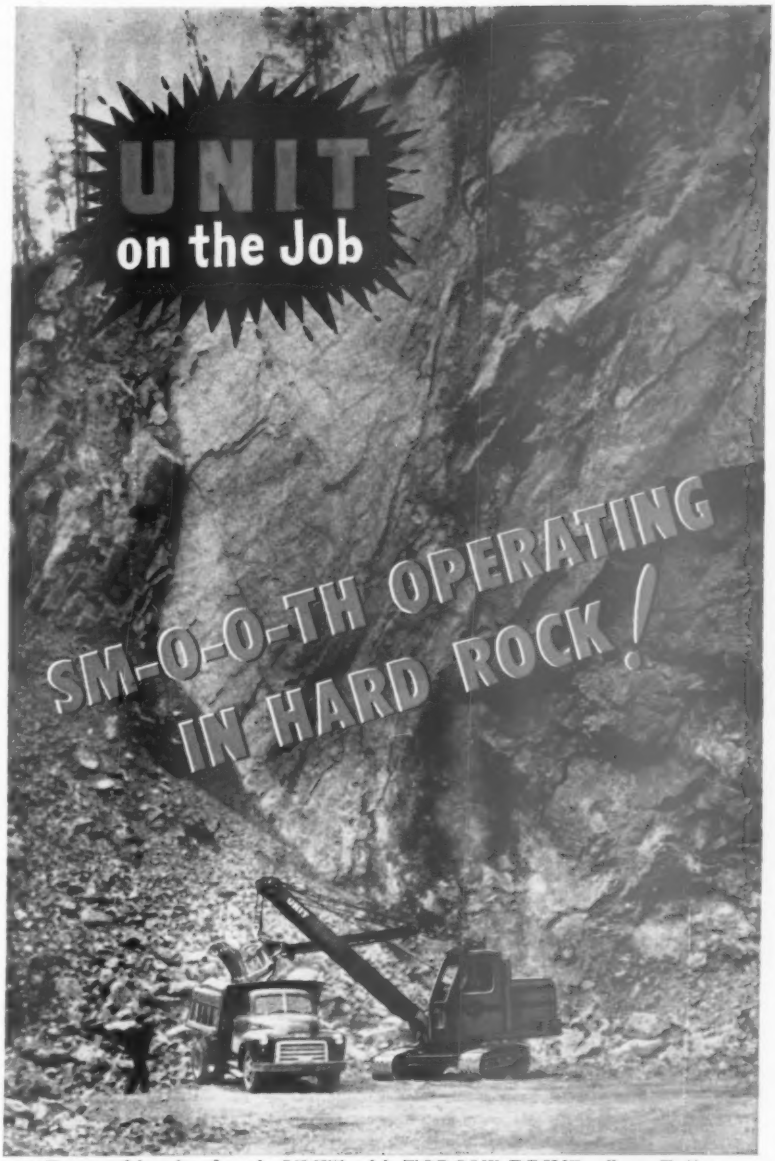
A committee of organization was appointed and given instructions, "To proceed promptly with the necessary steps for bringing into active existence The National Ready Mixed Concrete Association."

The formal resolution, which was adopted, included the stipulation, "it is understood that the term 'ready mixed concrete' includes all commercially produced concrete whether made in a central mixing plant and conveyed to the place of deposit, or whether the materials are measured at a central proportioning plant with the mixing done in transit or at the place of deposit."

The purpose of the new association was held to be that, "Of promoting the welfare and best interests of those engaged in the manufacture and sale of ready-mixed concrete."

The committee of organization was instructed to convey the appreciation of the industry to members of The National Sand and Gravel Association for their help in organizing the industry. It was agreed to accept the offer of The National Sand and Gravel Association, extending the use of its facilities, as long as agreeable to both associations.

The final organization meeting was held at the William Penn Hotel, Pittsburgh, on July 1930. Joseph Burke became the first president of the National Ready Mixed Concrete Association. As previously agreed, the two associations held their first joint convention in St. Louis January 25 and 26, 1931. By the time of the second convention which was held at Pittsburgh during the following January, the program had taken a more definite



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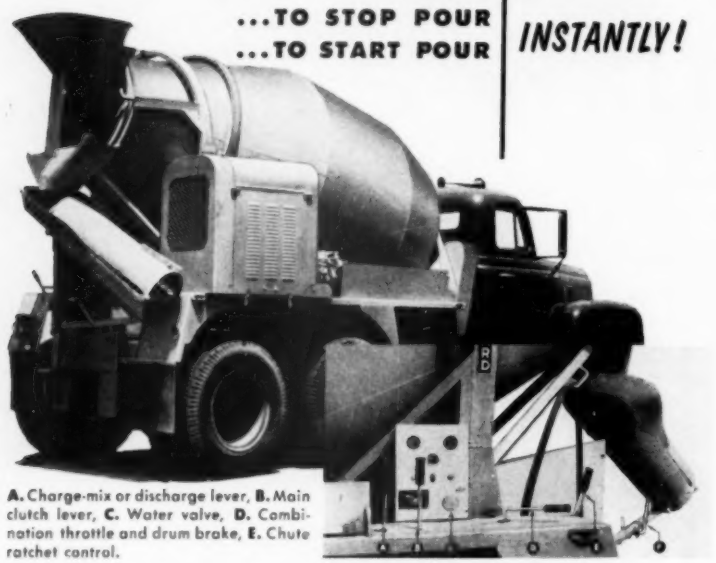
½ or ¾ YARD EXCAVATORS...CRANES UP TO 20 TONS CAPACITY
CRAWLER OR MOBILE MODELS . . . GASOLINE OR DIESEL

All Models Convertible to ALL Attachments!

5 and 6 C.Y. WILLARDS have *Positive Control*

...TO STOP POUR
...TO START POUR
INSTANTLY!



A. Charge-mix or discharge lever, B. Main clutch lever, C. Water valve, D. Combination throttle and drum brake, E. Chute ratchet control.

...Controls are Centralized

THERE IS LESS SPILLAGE, less trouble placing concrete with a big 5-6 c.y. Willard because the controls are centralized at the rear and because a Willard has a combination throttle and drum brake. You can stop or start the pour in an instant—no spilling, it can pour a cupful or a full load.

Note how main clutch, pump clutch, water valve and drum controls are conveniently located. Here is the truck mixer with the balance for extra large payloads. Drum drive is by Chrysler 6-engine with fluid drive. Has low center of gravity... short wheelbase mounting... and many exclusive features.

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and familiar form. The discussions covered such subjects as viewpoints of the architect and engineer, control of quality, purchase specifications, standard methods for testing concrete, plant operations, haulage methods, servicing of jobs, sales and customer relations.

The phenomenal expansion of the industry has already been mentioned. Similarly, an expanding, highly effective organization of the new ready mixed concrete association, was carefully planned and promptly put into execution. At least, during its early formative years, the close tie with the National Sand and Gravel Association was to prove of inestimable value. Almost overnight, a great new industry had been born.

The Highway and Building Congress, the 1932 election and the continuing depression furnished the background for the 1933 Detroit convention. Considerable attention was given to ready-mixed concrete specifications and to the possibility of selling concrete on a guaranteed strength basis. However, the main topic of conversation was "politics." The principal question was, "What kind of a President will Roosevelt make?"

One of the most interesting periods of the ready mixed story was the era of the "Blue Eagle" and Gen. Hugh Johnson. The background for this great experiment was the long lasting, worldwide depression. The always dramatic, ever exhorting general captured the headlines. Things began to move. The backbone of the depression was soon broken. In the acceptance of its code, the ready mixed concrete industry was given initial recognition by government. Undoubtedly as to profits, the N. R. A. code was of great immediate benefit to this industry, as well as to many others.

At a most opportune time, business got a healthy "shot in the arm." For a while, it was a business man's picnic. There was only one disquieting feature. The code had this to say, "employees shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from the interference, coercion or restraint of employers of labor or their agents." As unionism sprouted its wings, management's enthusiasm for the code soon cooled. To this day, labor regards the N. R. A. Code as its "Magna Charta." The short-lived, always highly controversial National Recovery Act has clearly left its mark in management-labor developments. Although the N. R. A. was invalidated by the Supreme Court on May 27, 1935, the March of Labor, which had its beginning rooted in the code, continues to this day.

During the 1939 convention held at Cincinnati, ready-mixed concrete producers showed considerable interest in the publication, by the association, of a manual that would adequately discuss operating problems of the industry. There was general reali-

zation that many problems—engineering, merchandising, selling, governmental regulations and restrictions, labor relations and others—had become nation wide in scope. A committee headed by Garvin Pelsue (today largely responsible for the excellent material on operating problems being issued by The Jaeger Machinery Co.) then of Los Angeles, was appointed to work on the preparation of a manual. At the 1940 meeting, one entire session was given over to a discussion on a manual for the industry. In 1941, the association published its first and only manual. The job of the committee had been completed.

The work of this committee, the continuing tireless efforts of Vince Ahearn and Stanton Walker, the earnest cooperation of many association officers, the assistance of The National Sand and Gravel Association, the development of state and area organizations, the many reports of A.C.I. and A.S.T.M., the important contributions of The Portland Cement Association and the findings of learned engineers, were to dovetail together in preparing this industry for the great progress it was to make during the ensuing ten years—in which era, ready mixed concrete became big business.

Push-Button Plant

(Continued from page 145)

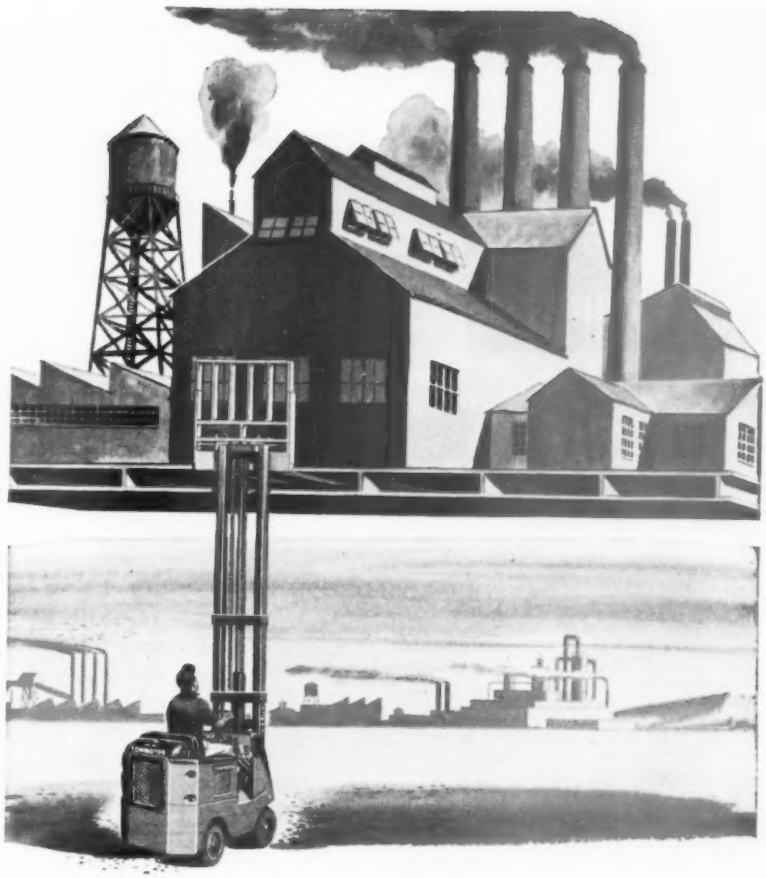
A completely equipped shop for maintenance and repair of trucks and other plant equipment is important to efficient operations. A carefully organized parts room adjoins the repair shop. Accurate cost records are kept on every repair operation including labor and materials used. Both shop and parts room are operated according to the best automotive practice.

The company's original fleet of 30 Mack trucks now being used are of varying capacities from 4½ to 5½ cu. yd. It is planned to standardize on 5½-cu. yd. mixer trucks in the future. With present plant capacity 30 to 35 trucks per hour can be dispatched.

The plant proper occupies a 4½-acre tract on the west side of Sherwood Ave. A five-acre tract on the east side of the street is used for storage of equipment. An average of 45 men are employed in the plant operations.

Adds to Product Line

PACIFIC COAST AGGREGATES, INC., San Francisco, Calif., has entered into a production-sales arrangement with Decorock, Inc., producer of naturally colored stone for home construction. Under the arrangement, Pacific Coast Aggregates will quarry the rock in the old "Mother Lode" mining area, and will also crush, package and store the product at the company's Kerlinger plant near Tracy, Calif. The company will also act as distributor for Decorock products in northern California.



Impossible?

The impossible is obvious . . . but perhaps you are missing some of the many possible TOWMOTOR applications around your plant. Besides receiving, warehousing, and shipping, TOWMOTORS can also save time, labor, and money on maintenance jobs. Lifting workmen to high walls and ceilings. Moving heavy machinery when and where needed most. With dozens of special attachments, TOWMOTORS speed production—change unwieldy dies, shake out annealed castings, pour chemicals into vats . . . handle every conceivable shape and material! Let us show you how much *more* TOWMOTOR can do and save for *you* . . . send for "Towmotor Portfolio for Executives." TOWMOTOR CORPORATION, Div. 4905, 1226 East 152nd St., Cleveland 10, Ohio.

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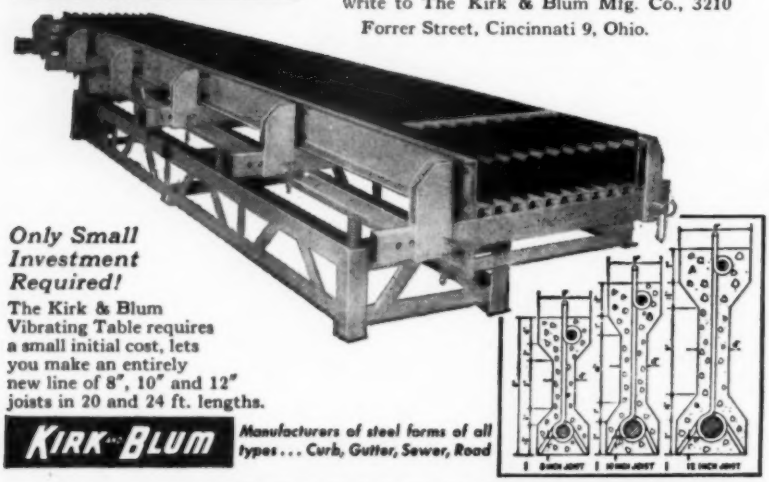
PRODUCE CONCRETE JOISTS, LINTELS AND FENCE POSTS with the KIRK & BLUM HEAVY DUTY VIBRATING TABLE . . .

Your experience in the building trade should make it easy to build up a profitable business in this new line. The products are simple to make, have unusual strength, are termite proof. The KIRK & BLUM Type "S" Heavy Duty Vibrating Table is capable of multi-production of concrete joists, allowing a fine profit-margin. Easily produced by unskilled operators. For complete details and prices, write to The Kirk & Blum Mfg. Co., 3210 Forrer Street, Cincinnati 9, Ohio.



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The Kirk & Blum Vibrating Table requires a small initial cost, lets you make an entirely new line of 8", 10" and 12" joists in 20 and 24 ft. lengths.

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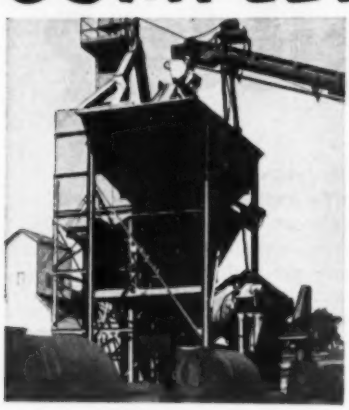

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Concrete Products Meeting

THE MO-KAN CONCRETE PRODUCTS ASSOCIATION held its January meeting at Kansas City, Mo., with over 150 members and guests in attendance. C. A. "Tom" Sirrine, well known architect and executive secretary of the Concrete Products Association of Michigan, delivered the prinicpal address, "Inside Concrete Masonry." His discussion, which was built around soundness of design and materials and correct construction procedures as the key to progress, commanded close attention due to his experience and prominence in the industry.

In addition to local concrete products producers, architects, engineers, masonry contracting representatives and representatives of the portland cement industry, there were concrete masonry producers from Nebraska, Kansas and out-state Missouri in attendance. E. W. Dienhart, executive secretary, National Concrete Masonry Association, Chicago, Ill., and Ray E. Berger, Martin Berger Cement Block Co., Detroit, Mich., were also guests at the meeting. Mr. Dienhart gave a short talk commending the Kansas City area for the leadership it has furnished in the national activities of the concrete masonry industry. The meeting was presided over by Gus Main, Kansas City Concrete Pipe Co., who is president of the association.

Concrete Short Course

A READY-MIXED CONCRETE SHORT COURSE was recently held at the University of California Extension, Los Angeles, Calif., the first such short course to be offered in that area. Co-sponsors of the course, in addition to the University of California Extension, were the Portland Cement Association, the National Sand and Gravel Association, the National Ready Mixed Concrete Association, the Southern California Rock Products Association, and the Southern California Ready Mixed Concrete Association. The course included classroom lectures, demonstrations, laboratory work and field inspection.

Principal instructors for the course included Samuel Hobbs, structural engineer, Portland Cement Association; Joe W. Kelly, professor of engineering, U. C. L. A.; and Stanton Walker, director of engineering, National Sand and Gravel and National Ready Mixed Concrete Associations.

Change in Corporate Name

TRUSSLAB CORP., Chicago, Ill., producer of lightweight concrete block, has announced the changing of its corporate name to National Block Co. The change became effective February 1, 1954. Ownership and management will remain the same. Officers of the company are B. F. Weber, Jr., president; Wm. B. Cobb, vice-president; Frank P. Reiland, treasurer; and M. J. Lycknell, secretary and general manager.

Make Money Manufacturing CEMENT DRAIN TILE

Today's tremendous demand for drain tile opens up a choice field for the wide-awake concrete products manufacturer. Either as a business by itself or as a profitable addition to the regular line.

The Champion machine makes all sizes of tile up to 12-inch diameter. With such a range you can supply not only the huge farm market, but many others where drain tile is urgently needed —reclamation projects, home building, road construction, subdivision activities, etc.

CHAMPION DRAIN TILE MACHINE

Tile made on the Champion are outstanding in quality—dense, strong, uniform. Far better than clay tile, yet can sell for less—even after allowing a handsome profit on manufacturing operations. The Champion machine is simple, compact, easy to operate.

Get the facts. Write for interesting literature about the business and the moderate priced equipment.

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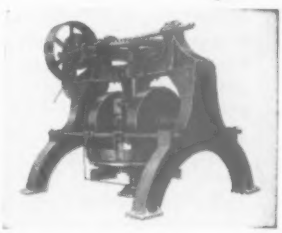

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American GRINDERS

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COMMENT
from the BUTLER ENGINEER

Recession? No! Farina? Yes!

Amazing! Hey, that's no word for a conservative engineer to use (sounds more like an adman). But there's no other word that expresses the response at the Ready Mixed Show at Chicago.

Recession? Gentlemen, there ain't gonna be any. Wise, farsighted executives in the Ready Mixed field and those who plan to enter it, have carefully watched the economic trends. They made no move until they were certain. *And then they went into action.*

Never have we been so busy at a Ready Mixed Show. I repeat "amazing".

And firm, solid orders. No "if's".

The same thing happened at the National Concrete Masonry Convention in Washington, D. C. If I'm any judge, both meetings could be listed as "Butler Preferred".

Happy as we are about those orders, we're happier still because of a broader aspect those orders imply: it's a positive and assuring sign that business — particularly in the construction industries is sound, solid and with a very, very bright future.

The reception of our Ready Mixed Show Exhibit was heart warming — and leaves us, not smug, but more than slightly proud. It was a carefully conceived, partially 3-D, highly abstract background design interpreting plant structural parts, materials and product flow. It was far from a literal presentation — and it went over big with the crowd. Many suggested it should be shown in art galleries as an outstanding example of top flight modern design in industrial interpretation. Thank you, kind sirs.

Well, we're back home after those banquets — and back to home-cooking, farina and skim milk, that is.

The Butler Engineer

BUTLER BIN COMPANY
WAUKESHA, WISCONSIN

Home Design Contest

THE WISCONSIN CONCRETE PRODUCTS ASSOCIATION is offering 12 prizes, totaling $3000, to winners of the concrete masonry home design competition which is being sponsored by the Wisconsin Architects Association. Architects, draftsmen and students of architecture who are residents of Wisconsin are eligible to compete in the contest. Awards will be as follows: First prize, $1000; second prize, $700; third prize, $400; and nine awards for "honorable mention" of $100 each.

The home to be designed is to be a one-story, two- or three-bedroom home, with a full basement. The living area is restricted to 1100 sq. ft. for a 2-bedroom design and 1200 sq. ft. for a 3-bedroom design. The homes will be within the $12,000-$15,000 price range. Other requirements include the use of modular dimensioned concrete masonry for all exterior walls; and floors of a type in which concrete masonry units form a major part, and which must be supported by load-bearing concrete masonry walls in the basement. There are no restrictions on the materials or design for the roof.

Over 100 persons have entered the competition which closes June 15, 1954. The designs will be judged by a five-man jury of award, selected from the roster of registered, practicing architects in Wisconsin. The awards will be made within 20 days following the close of the competition.

Correction Item

IN AN ARTICLE in the January, 1954, issue of ROCK PRODUCTS, p. 226, covering the fall meeting of the Southeastern Concrete Masonry Association, J. C. Garrison, vice-president, Greenville Concrete Co., Greenville, S. C., was inadvertently misquoted in the statement, "He said Italy was very prosperous when compared to England and the other European countries visited." The actual quotation from his speech was as follows: "From Germany, I went through Switzerland into Italy. The Swiss country was a delight to me and seemed so prosperous after seeing parts of England, France and Germany."

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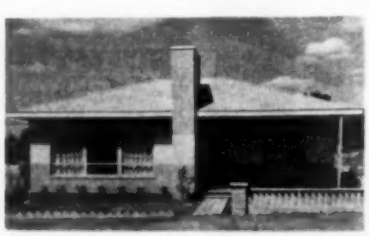
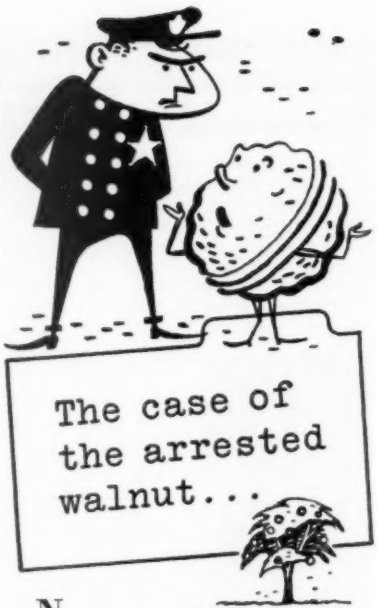


Shown above is the new plant office of Adams Concrete Products Co., Durham, N. C. Building is constructed of Solite block, with all walls exposed both inside and outside. The office was laid out in modular dimensions, with windows and doors of modular sizes. Split block were used for decorative planting area



Not long ago there was a West Coast walnut grower faced with the problem of shaking a lot of arrested walnuts out of a lot of walnut trees.

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It gave those walnut trees a bad time . . . kept those walnuts moving like tomorrow's neighbor . . . and left the walnut grower beaming happily.

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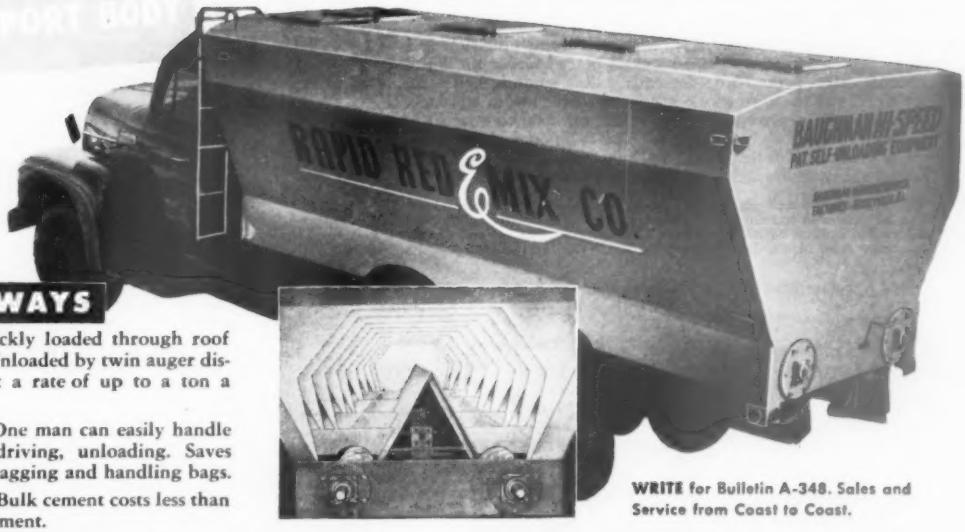

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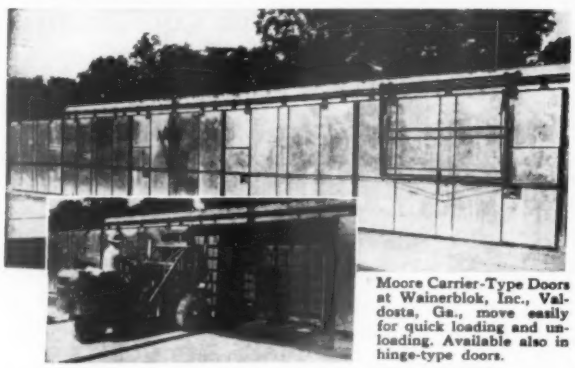

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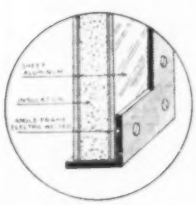

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Send us dimensions of present door openings for quotation.

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Made in 2 Sizes — 18" and 24" Models — Produces 960 Split Block per Hour in Fast, Automatic Operation

Splits block in a straight line, with speed and precision and with the utmost safety. The block is placed under the knife automatically . . . the blade descends with a smooth, hydraulic action . . . and the split block is ejected by the incoming block. The operator is always at a safe distance. Machine is easily adjusted for various block heights. The 18" model, shown here, splits block 16" or 18" long, 1⅝" to 8" high. A larger 24" model splits any length up to 24", heights up to 8".

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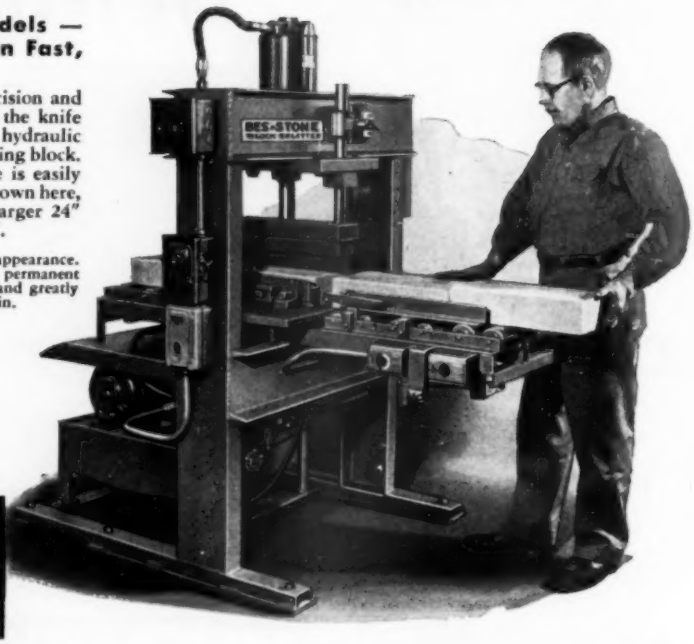

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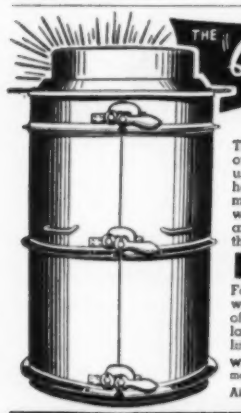

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QUINN HEAVY DUTY PIPE FORMS

For making pipe by hand methods by either the wet or semi-dry processes. Built to give more years of service—sizes for pipe from 10" up to 120" and larger—tongue and groove or bell end pipe at lowest cost.

WRITE TODAY. Complete information, prices, and estimates sent on request.

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The exclusive franchise for your territory may still be open.

For Complete Information Write

ROGER F. WILLIAMS, Licensor

3420 S. W. 9th St. Des Moines (15), Ia.

Why

VIBRAPAC OWNERS benefit by subscribing to

OSWALT SERVICE

Two patents have been allowed on Oswalt Improvements, one on the Synchronized Vibration, and the other on the Lug Link used in speed-up.

Write for our new BOOKLET

When your vibrapac machine is completely Oswalt-Serviced, you are assured of the "know-how" and experience which have produced satisfactory results in scores of plants.

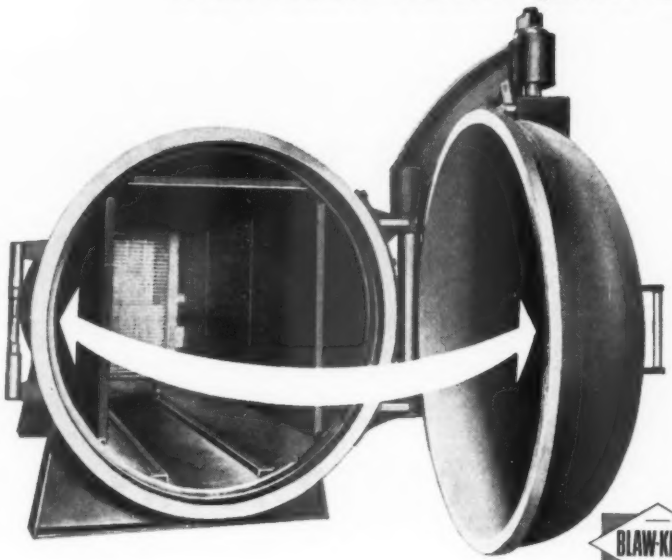
Oswalt Service pays for itself in maximum output, better quality blocks, improved plant efficiency, lower operating costs and bigger profits.

Investigate—by writing us for the names of Oswalt-Serviced plants nearest you.

OSWALT ENGINEERING SERVICE CORP.

1335 Circle Ave., Forest Park, Ill **Phones: EStebrook 8-3666, FOrest 6-3898**

cut this cycle to seconds with Blaw-Knox Quick Opening Doors



Whether operated manually or mechanically, Blaw-Knox Quick Opening Doors are locked, unlocked, opened, or closed in a matter of seconds. They reduce the time spent on operations incidental to your process cycle.

A rim-locking mechanism fastens the doors securely into place without lugs, bolts, levers or bars. Easily replaced, self-sealing gaskets are operated by internal pressure.

If yours is a closure problem, specify Blaw-Knox Quick Opening Doors. They can be adapted to horizontal or vertical vessels.

Write for Quick Opening Door Bulletin 2435.

BLAW-KNOX COMPANY

Blaw-Knox Equipment Division
Process Equipment Department
Pittsburgh 38, Pennsylvania

BLAW-KNOX

SUPERLITE UNLOADERS
INVITE COMPARISON

COMPARE — ITS ADAPTABILITY TO YOUR TRUCKS
COMPARE — ITS REMARKABLE VERSATILITY
COMPARE — ITS UNUSUALLY LOW COST AND WEIGHT

COMPARISON PROVES
ITS OUTSTANDING ABILITY TO MEET YOUR REQUIREMENTS

Write Today for Complete Information

BUILDERS EQUIPMENT CO.
4012 N. CENTRAL AVE. PHOENIX, ARIZONA

YOUR KEY TO POSITIVE ANCHORAGE IN CONCRETE

PERMANENT RUST PROOF THREADED SOCKET

SEE YOUR BLD'G. MATERIAL SUPPLIER OR WRITE TO:

STAR EXPANSION PRODUCTS CO.
147 CEDAR ST. N. Y. 6, N. Y

Have to share this copy of

ROCK PRODUCTS?

Enter your own subscription

ORDER TODAY!

WHERE TO BUY

BLOCK PLANT EQUIPMENT FOR SALE

f.o.b. 4852 Forestville Road, Forestville, Md.

2—FM-180 Block Machines (in use three years).
2—Regular Mold Boxes 8x8x12 Hollow Block.
1—Bevel Mold Box 8x8x12 Hollow Block.
1—Mold Box Semi-Solids 8x8x12 Block.
1—Mold Box Bevel Corners, Core, Core Bars & Stripper Plates 8x8x12 Block.
1—Double Partition Mold Box & Half Block Attachment 4x8x12 Block.
2 Pressure Heads & Plate Assemblies.
200 Transite Pallets.
1—30 CF Kelly Mixer with new bar liner plates.
1—Columbia 15 lb. Low Pressure H.T.F.B. Boiler 48" Diameter complete with stack.
1—Iron Fireman Stoker.
1—Automatic Electric Transporter and Charger—Model TW-4972.
1—Small Steel Hopper 30 cu. ft. capacity.

All above equipment is in good working order, painted and ready to go to work. All inquiries will be answered by return Air Mail.

SOUTHERN MARYLAND CONCRETE PRODUCTS INC.
4852 Forestville Rd., Forestville, Maryland

FOR SALE

JOLTCRETE & EQUIPMENT

1—No. 9 Jolterete 45% void pallets, racks, turntables, air offbearer and mold boxes for the manufacture of 4", 8", 12" concrete and cinder block. This equipment is in excellent condition. Also spare motors and parts for the above equipment. Daily average production per 8 hr. shift in 8" equivalents was:

Concrete Units 4320
Cinder Units 5760

BOX M-31, CONCRETE PRODUCTS
309 W. Jackson Blvd.
Chicago 6, Illinois

FOR SALE

BESSER "SUPER" VIBRAPAC

With one attachment. A-1 condition. Priced to sell.

FRIENDSHIP BLOCK & BRICK CO.
11800 PLEASANT ST.
DETROIT 17, MICHIGAN
Telephone: Vinewood 2-0200

LOWER COST
PACKER-HEAD WINGS
Proved to last as long or longer—yet cost considerably less. Write for prices.
TEXAS FOUNDRIES
LUFKIN, TEXAS

FOR SALE

Concrete Products & Ready-Mixed Concrete Plant. Located in one of the fast growing industrial areas of central South Carolina. It is equipped with late model Besser block machine, 6 mixer trucks, and all other handling and delivery equipment. It is now in operation, and has been operated for 2½ years. A modern designed plant. Present sales approximately $450,000 per year, should certainly grow. Ideal size for Owner-Management. Reason for selling: Owner is Manager, also has other management duties in larger plants. Wishes to slow down due to age, etc. Will sell reasonable, terms if desired. Complete information furnished upon inquiry. Replies to BOX M-35, CONCRETE PRODUCTS, 309 W. Jackson Blvd., Chicago 6, Illinois.

WANTED: Septic Tanks That Need Cleaning!

BIONETIC is a safe, sure, economical method.
Cleans sewage solids from tank.
Eliminates odors.
Cleans tile field, prevents plugging.
Cleans grease traps.
Harmless to humans and plumbing.

BIONETIC at $4.25 per pound, twelve one-pound containers to the case.
Bulk prices on request.

ADVISORY SERVICE—write us.

P. O. Box 6724, Dept. CP RELIANCE CHEMICALS CORPORATION Houston 5, Texas

EXTRA GOOD (used) PALLETS FOR SALE

3¾—ZONAL, Press Steel.
7¾—45% BABA, BATON, BASSO press steel.
7¾—50% DRAGON, single corner press steel.
7¾—50% Regular & double corner cast iron.

ALSO

Complete No. 9 Jolterete attachment to make SIDING Block on BABA & BATON press steel pallets. Complete No. 9 Jolterete attachment to make 11-11/16" block on PADDLE press steel pallets. CHASE No. 294 Steel Racks 72—8" block cap.

GUY D. MOODY
1011 CHESTER STREET, BRISTOL, VIRGINIA

FOR SALE
Concrete Block Plant Business

An established business, complete block plant equipment including ROCKERCRETE VIBRATING machine with 4 & 8 inch mold boxes 4000 Modular pallets 40 steel racks 28 cu. ft. mixer, Brikcrete Machine with 4 & 8 inch attachments and flat pallets with 16 cu. ft. Dunn Mixer, Tow Motor 4000 lb. capacity, elevator for unloading aggregate in over head bins, conveyor for unloading cement, boiler for curing blocks, all in good condition. Sacrifice for quick sale.

CASPERSON SUPPLY CO.
C. A. Casperson, Emporium, Pa.
Phone Dial 398 or 718

ROCK PRODUCTS

Has The Largest ABC Circulation and Highest Renewal Percentage in the Non-Metallic Minerals Industry

FOR SALE
Less Than One Year Old

COLUMBIA Model 8 (two block) fully automatic block machine complete with pallet feeder, electronic control unit, cubing return, pallet cleaner and oiler, two pallet hydraulic off-bearer, 8x8x16, 4x8x16, 12x8x16, 12x8x12, 8x8x16 bevel siding, attachments for solids, half block, sash block, patio block and air insulated 8x8x16 mold assemblies. Also included are 2,225—¼x18x18 steel pallets and 57—72 block steel racks.

The above equipment is less than one year old, located in Washington, D. C. and has been replaced by a Model 12 (three block) COLUMBIA.

COLUMBIA MACHINE WORKS
107 So. Grand Avenue, Vancouver, Wash.
or
W. K. Bryant, Strasburg, Virginia

USED BLOCK MACHINES

I have a rather complete line of used block machines located in different sections of the country, mostly plain pallet such as Fleming, Lithibar and Multiplex. Some Jolteretes and George machines, and some very excellent Columbia 2-2½ or 3 block machines which barely show any wear and are being replaced only due to the owners feeling the need for the 12 in. high mold box for specials on the new 1954 model Columbia. Also I keep track of "hot spots" or boom areas to set block plants and list some money-makers for sale.

MID-WESTERN CONCRETE EQUIPMENT CO.
Box 646, Mukwonago, Wisconsin

VIBRAPACS FOR SALE

2—8 Year old Vibrapacs, excellent condition. May be seen in operation, running at 945 —8" per hour. 10 H.P. Plugged Vibrator motors. Reconditioned in February.

BERGEN BUILDING BLOCK INC.
Industrial Avenue, Ridgefield Park, N. J.

KEEP ABREAST WITH INDUSTRY TRENDS THROUGH ROCK PRODUCTS

FOR SALE

100' precast concrete sill forms for 8" block construction with extra bottoms so 200' per day can be produced. Complete range of sizes for standard windows. Price $400.00.

Florida Modern-Crete, Inc.
878 - 31st Street So., St. Petersburg, Fla.

FOR SALE

L-5 three block Lith-I-Bar in perfect shape with all necessary molds including pallet return. Less than half price.

SPOKANE CONCRETE PIPE CO., INC.
P. O. Box 1481, Spokane, Wash.

CONCRETE BRICK COLORS
CEMENT COLORS
MORTAR COLORS
made by
BLUE RIDGE TALC CO., INC.
Henry, Virginia

BUILD GOOD WILL

Advertising necessities for the block industry. Line Pins, Twigs, Modular Coursing Stick. Also the new Block Calculator and Wood Corner Block. All imprinted with your advertising. Complete catalog on request.

GERSON CO.
99 DEERING ROAD, MATTAPAN, MASS.

GOOD WILL BUILDERS

For the block manufacturer. Help your contractors and bricklayers get quicker, easier and straighter masonry construction with U.B. tools that carry YOUR advertising. U. B. Corner ties Linestretchers, Line Pins and Twigs. We also wholesale a full line of tools for the blocklayer. Write for catalog and prices.

UNITED BUILDERS
1822 Lindberg Drive
Muskegon, Michigan

FOR SALE

50 Acrow Centers at half price.

Only used twice in construction.

Also: Besser Soffit Tile Attachment at half price.

TEXCRETE COMPANY OF ALEXANDRIA, INC.
P. O. Box 1472
ALEXANDRIA, LA.

UNBREAKABLE
PALLET RINGS
Write for full information
TEXAS FOUNDRIES
LUFKIN, TEXAS

FOR SALE — CEMENT BLOCK EQUIPMENT

1—Miles Elevator and Feeder, Below Floor Model.
1—Miles Face Down Block Machine.
1—C-G 14' Mixer.

Elevator and Mixer are brand new.

THE FERGUSON LUMBER COMPANY
Rockville, Indiana

FOR SALE

Fork and platform power lift trucks, used and guaranteed factory rebuilts.

ERICKSON POWER LIFT TRUCKS, INC.
1401 N. E. Marshall St.
MINNEAPOLIS 13, MINNESOTA
Phone—Geneva 0397

SALESMAN WANTED

To sell our famous Formula No. 640 colorless masonry sealer, silicone water repellent, concrete hardener, floor mastic, admix for topping floors always cold and wet, curing compound, rubber enamel, roof coatings, gilsonite paints, floor wax containing duPont's Ludox. Thirty products. Contact building owners and managers, contractors, etc. Commission. Territory. Name this magazine. Write Haynes Products Co., 4007 Farnam St., Omaha 3, Nebr.

WANTED TO BUY

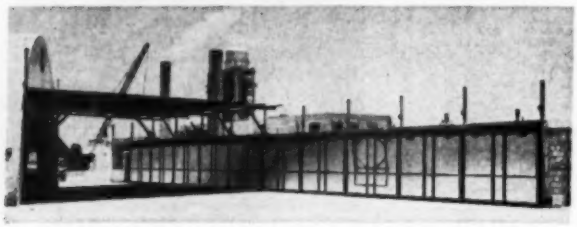
Good Used BLYSTONE mixer
5 or 7 yds.
BOX M-34, ROCK PRODUCTS
309 W. Jackson Boulevard
Chicago 6, Illinois

CEMENT COLORS

Write for free samples and prices of "LANSCO" CEMENT COLORS produced in 50 attractive shades. Packed in bulk and in 1 lb. and 5 lb. packages.

manufactured by
LANDERS-SEGAL COLOR CO.
73 Delevan St. Brooklyn 31, N. Y.

SAVE FUEL • REDUCE CURING TIME • CUT COSTS • UP PROFITS with *Standard* KILN DOORS!



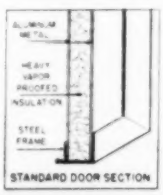
● This is the modern STANDARD kiln door installation of Portland Industries Inc., Riviera Beach, Florida. C. R. Wilson, the firm's Executive Vice President, writes: "Our Standard kiln doors have been very satisfactory."

To suit your individual requirements, three types of STANDARD kiln doors are available—the sliding carrier-type (shown above), the top hinge-type (which is pulled up by a hoist), and the side hinge-type.

CHECK THESE FEATURES

√ Heavy Aluminum Sheets on Both Sides of Thick Vapor Proofed Insulation.

√ Rugged Steel Frame.



STANDARD DOOR SECTION

Get the Best — Send for Details Now

STANDARD DRY KILN COMPANY

798 S. HARDING ST. . . . INDIANAPOLIS 21, IND.

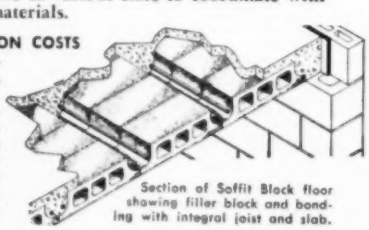
"I Find BOTH Profitable"

VIBRAPAC Block and SOFFIT Floor and Roof Filler Block

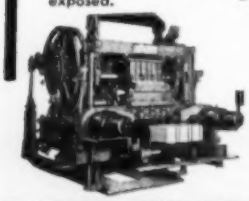
Vibrapac block plants are now adding to their profits by manufacturing Soffit Filler Block for floors and roofs. These units assure permanent, fire-safe construction, at low cost. Soffit Block provide maximum acoustical and insulation values with natural base for radiant heat installations. Made in various sizes to coordinate with other modular materials.

CUTS CONSTRUCTION COSTS

Temporary adjustable steel centers support Filler Block while slab and joist are curing. Conventional shoring is eliminated. The smooth, flush surface can be plastered, painted or left exposed.



Section of Soffit Block floor showing filler block and bonding with integral joist and slab.



BESSER VIBRAPAC

Vibrapac Block for walls, floors and roofs, in all styles and sizes, are made on a Besser Vibrapac, using one set of Plain Pallets. Fully automatic. No machine operator required. Write for descriptive literature.

BESSER MANUFACTURING CO.

ALPENA, MICHIGAN, U. S. A.

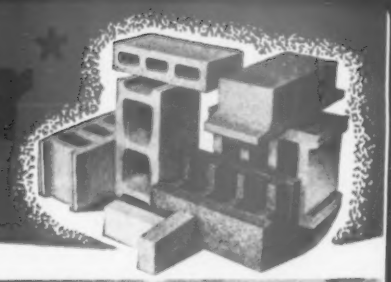
Complete Equipment for Concrete Products Plants

INDEX TO ADVERTISERS IN THE CONCRETE PRODUCTS SECTION OF ROCK PRODUCTS

SEE INDEX OF ROCK PRODUCTS SECTION ADVERTISERS ON PAGES 185, 186

Baughman Manufacturing Co., Inc.	163
Bergen Building Block, Inc.	167
Bergen Machine & Tool Co., Inc.	153
Besser Manufacturing Co.	148, 149, 164, 168, 169
Blaw-Knox Company	136, 165
Blue Ridge Talc Co., Inc.	167
Builders Equipment Co.	165
Burmeister, L., Co.	160
Butler Bin Company	162
Chain Belt Company	138
Cleveland Vibrator Company	162
Columbia Machine Works	131, 167
Concrete Equipment Co.	161
Davis, Frank D., Company	158
Ferguson Lumber Company	167
Fleming Manufacturing Company	161
Florida Modern-Crete, Inc.	167
Friendship Block & Brick Co.	166
Fuller Company	156
Gerson Co.	167
Haynes Products Co.	167
Heltzel Steel Form & Iron Co.	137
Jaeger Machine Company	135
Johnson, C. S., Co.	132, 133
Jones, J. A., Concrete Machinery	154
Kent Machine Co.	155
Kirk & Blum Mfg. Co.	160
Koehring Company	132, 133
Landers-Segal Color Co.	167
Lehigh Portland Cement Co.	147
Medusa Portland Cement Company	134
Mid-Western Concrete Equipment Co.	167
Moore Dry Kiln Company	163
Moody, Guy D.	167
Oronite Chemical Company	151
Oswalt Engineering Service Corp.	164
Quinn Wire & Iron Works	164
Reichard-Coulston, Inc.	163
Reliance Chemicals Corporation	166
Riddell, W. A., Corp.	161
Smith, T. L., Company	130
Southern Maryland Concrete Products, Inc.	166
Spokane Concrete Pipe Co.	167
Standard Dry Kiln Company	168
Star Expansion Products Co.	166
Stearns Manufacturing Company, Inc.	170
Texas Foundries	166, 167
Texcrete Company of Alexandria, Inc.	167
Thew Shovel Co.	150
Towmotor Corporation	159
Unit Crane & Shovel Co.	157
United Builders	167
United States Steel Corp.	128
Universal Atlas Cement Co.	128
Willard Concrete Machinery Sales Co.	158
Williams, C. K., & Co.	154
Williams, Roger F.	164

Another BESSER Booster*



★ This is the 108th of a series of ads featuring leaders in the Concrete Products Industry who are stepping up block production with Besser Vibrapac machines.

(Right) Fleet of motor trucks used by Angelus Block Company for delivering Vibrapac Block to customers in the San Fernando Valley.

(Above) Filippo Fordellone, Vice President, Edward Antonini, President and Thomas M. Jamieson, General Manager of Angelus Block Company.

(Above) Loading block with the aid of a lift truck. Many block plants are today cubing block by power. This eliminates the outmoded hand lifting of block and speeds up deliveries.

Two AUTOMATIC VIBRAPACS in Burbank, California Products Plant Enable Firm to Increase Sales by 400%

Angelus Concrete Block Company, Burbank, California, operates the largest and most modern concrete and cinder block plant in the San Fernando Valley. The company installed their first Besser Automatic Vibrapac in 1947. Since then, they have added another Automatic Vibrapac and a third Vibrapac will be installed this year. When Edward Antonini, President, was asked why Vibrapacs were selected, he said, "We chose these machines because they give us precision masonry units at mass production with a minimum of downtime".

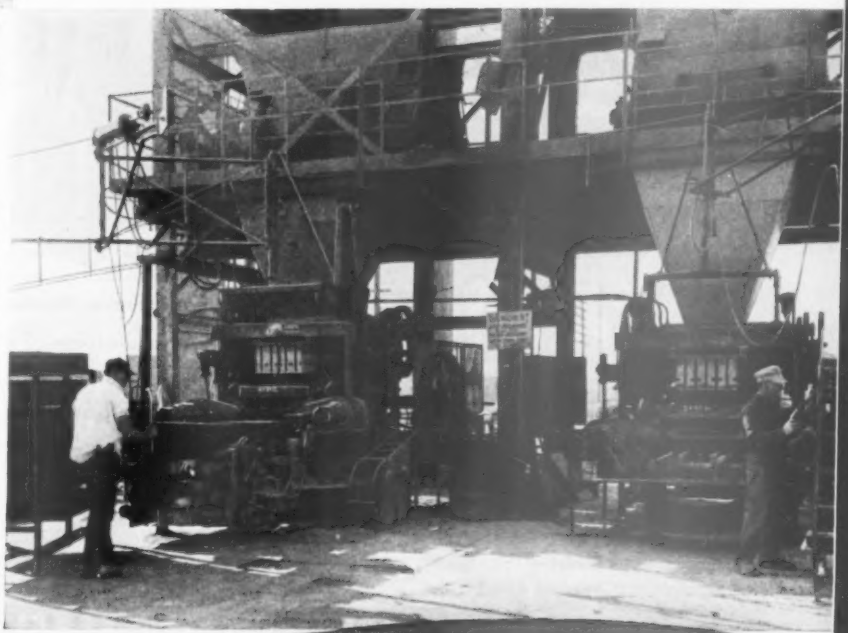
The successful operation of these Automatic Vibrapacs is reflected in the fact the company today produces and sells 500,000 masonry units (8" or equivalent) per month. Company literature states: "Angelus Block are incomparably superior to any made so far, anywhere. They become, in effect, a new building material, rich in outstanding advantages". Perhaps this explains why the Angelus Company was able to increase block sales during the past six years by more than 400%.

BESSER MANUFACTURING CO., Box 135, Alpena, Mich., U. S. A.

Complete Equipment for Concrete Products Plants

Automatic Vibrapacs in Modern "Open Air" Plant

Produce both lightweight and Concrete Masonry units in all types and sizes. Fully automatic. Each machine produces three 8" x 8" x 16" modular block on one Plain Pallet. Other sizes produced in equivalent multiples on the same set of Plain Pallets. No machine operator is required. Hand labor is reduced to pushing a switch button and guiding a power off-bearing hoist.



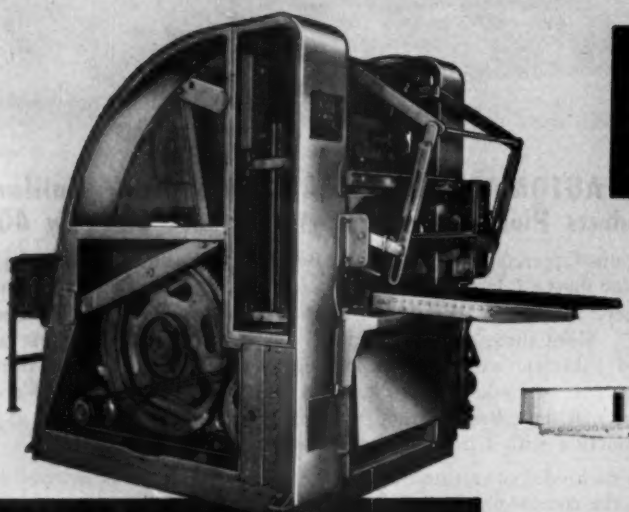
BESSER 50th Anniversary 1904-1954

A Half Century of Concrete Masonry Progress!

A 7831-1PBC

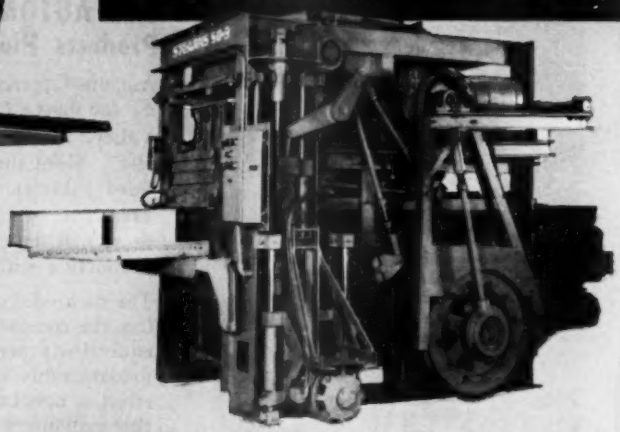
STEARNS...THE IDEAL MACHINE

...The Lowest Block Production Cost For Any Plant!



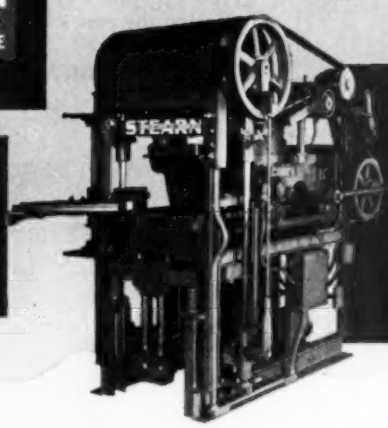
STEARNS 50-3* for the large producer. 3-blocks-per-cycle. *Absolutely—the lowest block production cost per machine dollar.* Plain pallets.

3 BLOCKS PER CYCLE



STEARNS 15 for the *maximum* producer. 3-blocks-per-cycle. *Maximum production, minimum maintenance.* Plain pallets. This is the peak!

3 BLOCKS PER CYCLE

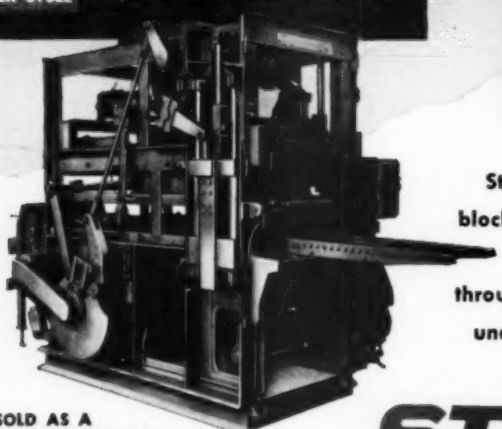


STEARNS ZIPPER... for the smaller plant. *Semi-Automatic. Large machine quality — small machine cost.* Cored pallets. Built to *expand* any small manufacturer's market.

1 BLOCK PER CYCLE

STEARNS 50* for the medium-large plant. 2-blocks-per-cycle. Economy—*plus!* Plain pallets. Really turns them out!

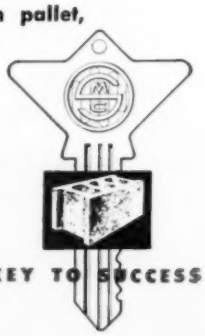
2 BLOCKS PER CYCLE



Stearns makes *the* machine in *any* field of concrete block manufacture. Fully automatic, plain pallet, one-man operation. Perfect blocks through Stearns Unidirectional Vibration under Pressure. Minimum downtime.

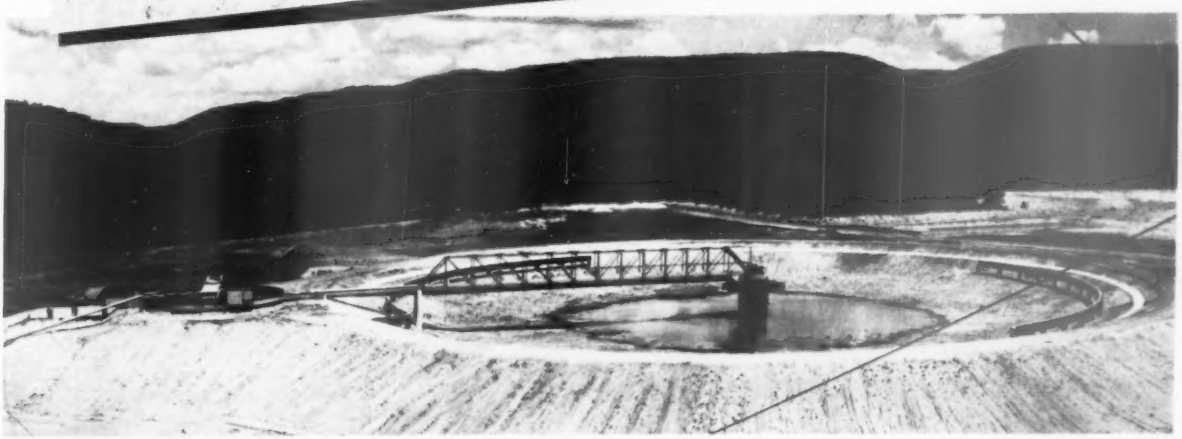
*SOLD AS A COMPLETE PACKAGE— *Complete with Standard Attachment, Magnetic Offbearer and Automatic Pallet Return.*

STEARNS
MANUFACTURING COMPANY · INC
ADRIAN • MICHIGAN



How PENNSYLVANIA GLASS SAND teams up DORR equipment for maximum economy...

Left—Closeup of Bowl Desiltor with 31′ 8″ dia. bowl.
Below—Overall view of installation with 250′ dia. Dorr Clarifier at right.



By combining two modifications of basic Dorr machines, Pennsylvania Glass Sand Corporation effects a high degree of waste treatment . . . at an amazingly low installed and operating cost. Here's how it's done:

STEP NO. 1 — Waste water from the silica plant goes first to a Dorrco Bowl Desiltor, a low cost modification of the Dorr Bowl Classifier. The Desiltor removes most of the −100 +325 mesh silica in a clean, drained condition.

STEP NO. 2 — Desiltor overflow then flows by gravity to a 250′ dia. Dorr Clarifier equipped with a flocculating feed-well and installed in an earthen basin. Clarifier underflow, containing the −325 mesh material, is impounded, and the clarified overflow is discharged into the Juniata River.

This economical installation at Pennsylvania Glass Sand's Hatfield Works is a good example of Dorr's ability to provide the equipment to fit the job. If you would like more information on the Bowl Desiltor and Dorr Clarifier-earthen basin team, just drop a note to The Dorr Company, Stamford, Conn., or in Canada, The Dorr Company, 26 St. Clair Ave. East, Toronto 5.

Better tools TODAY to meet tomorrow's demand

DORR

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

THE DORR COMPANY • ENGINEERS • STAMFORD, CONN.
Offices, Associated Companies or Representatives in principal cities of the world.

FIFTY YEARS of Service 1904–1954

New simplicity and sustained efficiency in dust filtering and collection . . .

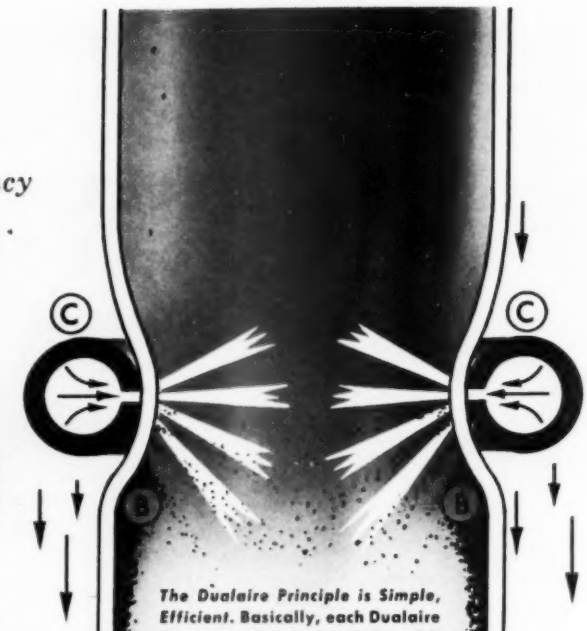
Dualaire*

REVERSE-JET DUST COLLECTOR

Efficiencies up to 99.99%

Cloth filter systems of one design or another have long been used by industry for cleaning industrial gases and/or recovering dust or other suspensions. But three problems are common to such systems... (1) Extreme changes in pressure drop and filtering efficiency as dust cakes accumulate on the filter surface... (2) Wide pressure fluctuations and surges in the plant system as filter units become clogged or are cut out and rapped for cleaning... and (3) Rapid deterioration of the filter material by the vibration, shaking and rapping equipment used for cleaning.

But now the DUALAIRE Collector—as engineered by Western Precipitation, pioneers in the field of dust recovery—provides the answer to these and other problems common to conventional bag-house equipment.



The Dualaire Principle is Simple, Efficient. **Basically, each Dualaire filter unit consists of a cloth or felt tube, open at both the top and bottom. (A) Dust-laden gases enter at top of the tube and are filtered as they pass through the side walls of the tube to the exhaust system. (B) Dust particles collect on the inside of the tube and *before* the cake builds up sufficiently to affect filter operation, a tubular blow ring (C) automatically starts moving up and down the outside of the filter cylinder. A jet of air, concentrated by this blow ring, reverses the normal gas flow at the point contacted by the ring, thus jetting the dust layer off of the inner surface of the filter tube.**

This jetting action is further assisted by a flexing of the filter cylinder as the blow ring passes, thus cracking and loosening the dust layer from the inner surface, from where it drops to the recovery chamber below the bottom of the tube.

The entire operation is positive and simple. The blow ring starts its action *automatically* as soon as the dust layer causes a pre-determined pressure differential. And after the filter surface is cleaned, the blow ring *automatically* stops.

6 ADVANTAGES OF DUALAIRE DESIGN...

PRESSURE DROP remains uniformly low at all times because the dust is removed continuously in *small* portions.

FILTERING EFFICIENCY remains uniformly high at all times without the "choking" action characteristic of conventional bag-houses. Actual field tests show efficiencies as high as 99.99%!

DUST RECOVERY is in steady increments — not in sudden large "batches" as with conventional rapping systems. Thus the Dualaire eliminates surges and detrimental variations in the plant system.

FILTER ELEMENT has a much longer life because it is not subjected to the stresses of rapping or jarring while being cleaned. Dualaire reverse-jet cleaning action is gentle, yet far more effective.

GREAT SAVINGS are also made in space and the size of installation required. Because each Dualaire filter unit is cleaned more-or-less constantly without shut-down, there is no need for costly standby units — or the complicated switching equipment to cut standby equipment in and out.

BASIC UNITS are "sectionalized" and are available in 5 standard heights. Sections can be bolted together in any desired multiple, providing a capacity range to fit virtually any requirement. As needs increase, add more sections.

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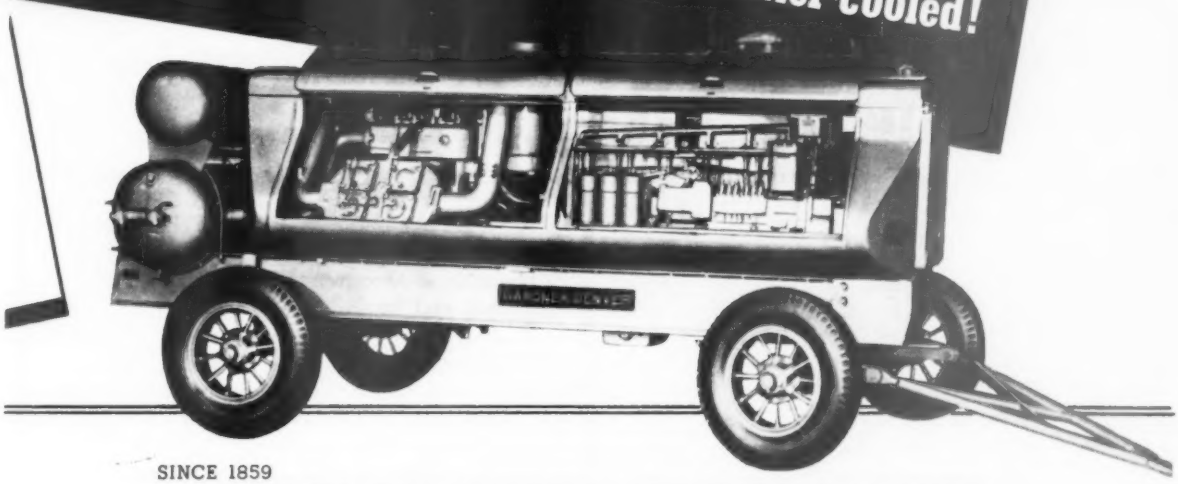

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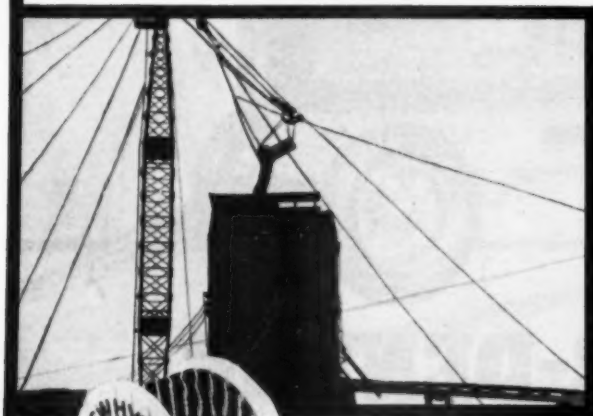

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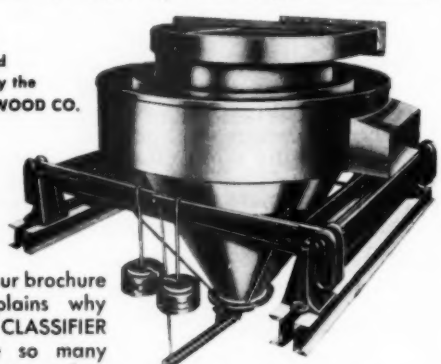

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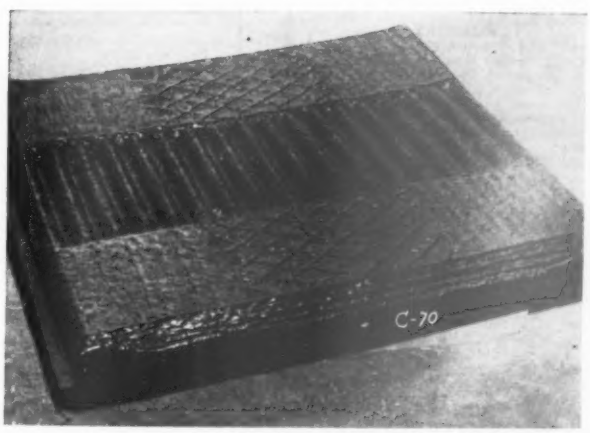

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CRUSHERS: Gyratory 20", 36", 42", and 48". Nos. 12, 10, 9, 7½, 6, 5 Allis-Chal. and others.
JAW TYPE: 24x36, 25x40, 28x36, 40x48, etc.
CONE TYPE: Symons 2, 3, 4 and 5½'. No. 36 Telsmith. Also Kennedy 19, 25, 37 and 49. Traylor 1'9" and 2'4" TY. Newhouse 7, 10 and 14". Steadman 24, 30 and 36" Impact. Allis-Chalmers Ty. R.
ROLLS: Allis-Chal. 72x30, 54x24, 54x20, 40x15 and 18x10. Pioneer 18x30. Universal 16x24. New Holland 24x16 and 16x16. McLanahan 18x24 and 18x30.
HAMMERMILLS: Williams Nos. 2, 3, 4 and 6. Day Nos. 40 and 70. Gruendler 2XB and 3XB. Dixie 2040, 3650 and 5040, and others.
MILLS: Hardinge 3'x8", 6'x22", 6'x3' and 8'x4'. Kennedy 4x8, 5x6, 5x11. Marcy 4x5, 6x4, 7x16. Raymonds, Sturtevants and others.
CRUSHING PLANTS: 24x36, 25x40, 30x42 and smaller. Also complete stationary plants.
DRYERS: 90"x60', 7'x50', 10'x90', 8'x50'. Etc.
SCREENING PLANT: Large modern plant new in 1946, priced at ⅓ original cost.
DRAGLINES: Page 8 yd. 160' Bm.; Page 6 yd. 125' Bm.; 5W Monighan 5 and 7 Yd. 125'.
BINS & BATCHERS: 20 yd. capacity & larger.

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Barges, Bins, Buckets, Boilers, Cableways, Cars, Compressors, Conveyors, Cranes, Dryer, Derricks, Draglines, Drag Scrapers, Dredges, Drills, Engines, Elevators, Excavators, Generators, Hoists, Kiln, Locomotives, Loaders, Motors, Pipe, Pumps, Rail, Scales, Screens, Slacklines, Shovels, Tanks, Trucks, Tractors, Etc., in many sizes, types and makes at low prices. (I have equipment at many points in the United States and Canada. What you need may be near your plant.)

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EUCLID REAR DUMP TRUCKS, 22 TON

Good Condition, Fifteen in stock.

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Birmingham 1, Alabama

90"x60' Christie indirect heat dryer.
Nos. 12, 10, 9, 8, 7½ and 6 Allis-Chalmers gyratory crushers.
222, 622, 636 & 236 Allis-C Hydrocone Crush.
6'x22" Hardinge ball mill.
1—42"x16", 36"x16", and 24"x12" crushing rolls.
1—Complete lime hydrating plant.
1—42"x48", 24"x36", 18"x36", 15"x30", 12" x24" jaw crushers.
6x12 & 5x10 Rod mills.
14", 16", 8" and 6" McCully Superior Gyratory Crusher.
5' x 50' x ⅜" dryer. 8' x 120' & 7' x 120' kiln.
New and Rebuilt Dryers—Kilns and Coolers

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where we shall continue our 37 years of service to you.

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8—6'x40', 5'x40' Ruggles-Coles; 54"x25' Class Xf-4 Ruggles-Coles, also 3-3'x50', 5'x50', 6'x60', 7'x70' Direct Heat. Also 3-6'x50' Louisville Rotary Steam Tube.

3—Link Belt Roto Louvre Dryers—#207-10 (2'7"x10'); #502-16 with all stainless steel contact parts; #604-20.

3—3'x50' (or Coolers) made by Bonnot Co., Canton, Ohio.

ROTARY KILNS:

1—6'x120' Vulcan Rotary Kiln.

CRUSHERS:

Jaw—2"x6", 6"x15" Sturtevant, 18"x36" and 24"x36" Farrel; 42"x48" Traylor; Rolls—42"x16" Allis Chalmers Type B; 24"x32" Penna Single Roll. Portable Plants—Cedar Rapids 1036-BBB; 2540-AAAA, 2036-AAA. Also Pioneer with 30"x42" primary and secondary Crushers, all Diesel driven.

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1—#5047 Raymond High Side Mill.

2—#6669 Raymond Super Mills.

6—#1, 0, 00, 000 Raymond Mills.

3—#0, 00, 8" Raymond Screen Mills.

2—#51 Raymond Imp. Mills.

3—Mikro #4TH, 2TH, Bantam SH.

BALL AND TUBE MILLS:

6—Hardinge Mills, 3'x8", 5'x22", 6'x22", 8'x48".

4—Tube Grinding Mills, Made by Traylor. E. & M. Co., Allentown, Pa., Silex Lines, 4'x13', 4'6"x18'6", 5'x22' and 5'x20'.

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D7 Tractor Dozer — Caterpillar Diesel, Ser. #3T4669. equipped with "Cat" 7S straight dozer and "Cat" #25 rear DDPCU. Has crankcase guard, front pull hook, large idlers, heavy duty equalizer spring, 20" grouser tracks. Has just emerged from our shop where tractor was thoroughly gone over. Master clutch linings and brake linings replaced and put in overall very good condition. Has been cleaned and painted and presents a bargain at our special price. f.o.b. Louisville, Ky. **$7,750.00**

D7 Tractor Dozer — Caterpillar Diesel, Ser. #3T13469, equipped with "Cat" 7A angledozer, "Cat" #25 rear PCU, #24 front mounted unit. Has complete elec. system with 4 lights, heavy duty equalizer spring, crankcase guard, large front idlers, front pull hook and 22" track shoes. Machine was delivered new in 1951. Just reworked at a cost of over $3450.00. Tracks have recently been pinned and bushed. Rollers have been reworked and machine has many profitable hours ahead of it. Special price **$10,950.00**

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Manitowoc Used Shovel Attachment, complete, for Model 1600 or Model 2000.
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Rex 3 yd. Hi-Discharge Transit Mixers (2) mounted on Int. LF190 tandems, 1950 and 1951 models.
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Haiss "75C" Used Bucket Loader. Crawler-Mounted.

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CRUSHERS: 1016 CR, 1218 Acme, 1524 & 1536 Diamond, 2036 CR, 2436 Lippman, 2540 CR, 3042 Pioneer, 4836 & 4248 Traylor JAW. 2.5 & 37 Kennedy 7" Newhouse, 12K Gates, 10, 14 & 16" McCully, 16B Telsmith GYR. 2, 3 & 4' Symons, 36" Penna. Gyracone. 2416, 3616 & 4020 DBL ROLL.

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BELT or DRAG

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WANTED TO BUY

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WANTED

3 ROLL CRUSHERS

Buchanan (Birdsboro) Preferred.

FRANK SAMUEL & CO.

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Number 10 Pioneer Gravel-Crushing-and-Loading-plant with 9" x 36" jaw, and Model L Case mounted motor. Also 2 conveyors 60' and 35' with Wisconsin motors.

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Quarry Equipment

1036/2418 Cedarapids Jr. Tandem on rubber.
Cedarapids Rock-It plant w/2225 jaw, 3033 hammermill.
2020 Cedarapids double impeller. Rebuilt.
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60-ton, 2-comp., 8'x18' storage bin w/clam gates.
Special bins to your specifications.
Conveyors—18"—24"—30"—36". Also belt.
24" dia. x 30" face magnetic pulley.

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Lorain L-41, ¾ yd. shovel, clam.
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Sanderson-Cyclone No. 42 well drill.
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600 cu. ft. Gardner-Denver. Rebuilt.
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365 cu. ft. Gardner-Denver. New condition.
105 cu. ft. Schramm gas powered on 4 steel wheels.

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195 to 930 Barrel Capacity with Elevators, Weightbatchers, Electric or Gas power. Also Two Three and Four Compartment Bins for One Stop Plants, Portable, or will build to suit your needs.

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1—Joy Heavy Weight Champion Rotary Drill—Model 58 BH. Purchased new—December, 1951.

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WITH INDUSTRY TRENDS

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ROCK PRODUCTS

Apron Conveyor 45' center 24" overlap plates.
Apron Conveyor 16' 40" wide, New, slat type.
Enclosed Hummer screen, type 31, 6'x5'.
Universal vibrating screens, single and double deck.
Selected lot of screen cloth, assorted sizes.
Water pumps 2" to 14", some motor driven.
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New and used conveyor belt to 36".
3—10" Rotary Feeders with ¾ hp. gear-motors.
Enclosed elevator 63' center, 10"x6" buckets.
Enclosed elevator 64' center, 8" x 5" buckets.
Enclosed 20" bucket elevator 75' center, Sup. Cap.
Mead Morrison single roll crusher 24" dia. 30" wide.
Robins double roll crusher 18" dia. 24" face.
Penna SXT—8 Hammermill.
Stedman hammermill 24" dia. 30" face, type No. B30.
Gruendler 2XA Hercules type pulverizer.
Good Roads 1030 late type jaw crusher.
Replacement buckets for elevators of all sizes.
Replacement jaw blades and toggle plate.
Screw conveyors 9" and 12" with troughs.
Conveyor pulleys of cast iron and steel.
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Link Belt 5 hp. electric car puller, gear-motors, Reducers and electric motors.
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Putnam machine lathe 20" x 5'.
Merrick Weightometers for 16" and 30" wide belt.

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Size No. R-3125 1½ yd.
Blaw Knox Single Line
New Bucket Cost $2800.00
Our Price **$1750.00**

5-ton Overhead Traveling Crane
65' Wide, 185' Long, 40' Lifting Boom
Good Condition **$7500.00**

Lorain 55 Crane with Shovel front and Combination Dragline and Clamshell Boom **$6000.00**

1¾ yd. P & H Dragline with 90' Boom **$6500.00**

All located at Richmond, Va.

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WANTED

1 BRADLEY GRIFFIN MILL
Quote price and condition.

NATURAL TUNNEL STONE CO.
NATURAL TUNNEL, VA.

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Hickman portable crushing plant, straight-in-line, solid rubber tires, self-propelled, 10 x 36 roller bearing crusher. A-1 condition. $8500.

Barney Schlude
705 Dodge Street, Kaukauna, Wisconsin

Special Crushers!!

Pioneer 40x22 roll crusher Diesel powered.
Cedar Rapids 40x30 Hammermill Twin GMC Diesel.
Jeffrey Fiex-Tooth 42x36" hammermill.
Pennsylvania C-4-30 Reversible Hammermill.
Jeffrey Type B Hammermill 36x42".
Raymond No. 412 bowl pulverizer mill.
FARREL BACON 30" x 48" Jaw Crusher.
Traylor TY 4' with 200 hp. electric motor.

DREDGES

Ellicott 12"x10" new pump with new V-12 385 HP Diesel engine. Port. steel hull.
Ellicott 8" with cutter. Diesel Hull 48'x18'x3'6".
8" Hydraulic. Diesel. On 32'x8' steel pontoons.
Amaco 10" Diesel power portable. Excellent.
6" portable Diesel complete with cutters, etc.
8" H-P twin Diesel drive. Complete.

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Heltzel 1000 bbl. cement silo with elev. scales, etc.
Smith 56-S two yard tilting mixer. Complete.
Johnson 200 yd. 5 comparts. Complete large plant.
Johnson 150 yds. new 1950 3 compt. aggr. one cement ground silo 500 bbls. two 28-S mixers.
Johnson 55 yds. 5 compts. aggr. and cement 1050 bbls. silo.
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Butler 250 bbls. cement B-K 100 ton 3 compt. agg.
NEW S-S 100 ton agg. bin 3 compt.
NEW S-S 400 bbl. cement bin complete.

CRUSHING PLANTS

Cedar Rapids Portable Super Tandem, excellent.
Pioneer 40-V. New 1946. Portable. Diesel power.
Pioneer WA-300, crushing, washing, screening.
Cedar Rapids AAA Port. Primary crusher 20x36.
Cedar Rapids 40x33 Port. Secondary, Diesel.
Cedar Rapids Portable Master tandem.

CRUSHERS

JAW: Acme 10x20, 14x26, 14x28, 10x42, 16x32, 18x32, 25x40. Eagle 20x36. Diamond 24x36". Cedar Rapids 10x20, 20x36, 25x40. Farrell 10x20, 13x30, 14x36, 18x36, 36x48. Buchanan 36x42. Good Roads Reliance 15x30. Traylor 18x36, 24x36. Allis-Chalmers 30x18. Good Roads 10x30. Telsmith 18x32. Champion 1030, 1040, 1236, 1530.
GYRATORY: Allis-Chalmers-McCully, 6", 7½", 8", 9", 12R, 20", 30", 42", 14", Newhouse, 24", 26". Gyrasphere, 18", 28". Intercone Telsmith, Telsmith 5H, 10-B, 13-B, 16-B. Kennedy Van Saun 7, 19, 25½-S, 37. Traylor Ty 1'8", Ty 2'4", T-4½".
ROLL: Cedar Rapids 40x20. Diamond 40x22. Pioneer 30x18. Telsmith 24x16. Pioneer 30"x18". New Holland 24x16.
HAMMERMILL: Size 4 Williams Jumbo, Pennsylvania 8X2, 22x22. Cedar Rapids 20x33. Jeffrey 36x42, Jeffrey 36x24, 36x40.
BALL MILL: Hardinge 10'x48", K.V.S. 6'x8' Type M Air Swept J-H 6'x6', Hardinge Conical 6'x22". Colorado Iron Works 5'x6'; Marcy No. 64½. Hardinge conical 10'x36".
ROD MILL: March 2'x6'. 3'x6'. Allis-Chalmers 4'x8'. Hardinge No. B 206. Marcy 8'x12'. Hardinge 8'x22".
CONE: Symons 2' coarse bowl, 3' standard head.
TUBE MILL: Smidth 5½x20, K.V.S. 4'x7', Traylor 5'x22'.
DRIERS: Struthers-Wells 7'x64'; others 7'x20', 6'x30', 7'x70', 6'x40' and Cedar Rapids 60"x24'.

SHOVELS—CRANES—DRAGLINES

P&H 955 ALC Crane 2½ yds. 130' bm. 1951.
P&H 655-B, 1½ yd. Diesel Crane, 60' bm.
P&H 255-A, ¾ yd. Shovel-Crane, Diesel.
N-W 80-D 2½ yd. Dragline. Diesel. 100' boom.
N-W Model 6, 1½ yd. Diesel Shovel.
Northwest 80-D Diesel Shovel 2½ yd. New 1951.
Lorain L-820 2-yd. Shovel-Drag-Crane 100' Bm.
Lima 1201, 2½ yd. Diesel Shovel.
Manitowoc 3500, 2½-yd. High Lift Shovel.
Buc-Erie 54-B Diesel Shovel, 2½-yd.
Manitowoc 3500 Dragline 140' boom, new 1950.
Northwest 23 Diesel, ¾ yd. Shovel.
Lorain Model MC 414, Moto-Crane, 85' Bm. Exc.

SCREENS

Seco Double deck 6'x12'.
Kennedy-Van S. 4'x10' three deck.
Telsmith heavy duty washer 60"x13'.
Diamond 4'x10' three deck.
Lippman 4'x12' single deck.
Simplicity 4'x10' four deck.
Symons 4'x14' double deck.
Tyler 4'x10' two deck heavy duty, motor, Gen. Set.
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2 Cat. D8 Angledozers with DDPCU rebuilt.
Int. TD-18A with B-E Bulldozer.
Int. TD-24 with B-E Cable Bulldozer.
All-Chal. HD19 Angledozer, Hydraulic.
All-Chal. HD7 with Gar Wood angledozer.
Allis-Chal. HD19 with hydraulic control angledozer.
Cat. D4 Tractavator with 1 yd. bucket, hydraulic

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45 Ton G.E. Diesel Elec. Loco., std. ga.
25 Ton Plymouth gas loco., std. ga.
Vulcan 20 ton standard gauge type 0-4-0 gas.
20 Ton Vulcan, gas, std. ga., rebuilt.
25 Ton Vulcan steam, std. ga., Side tank.
15 Ton Whitcomb 36" ga. gas.
Plymouth Model ULDA std. ga., 10 ton, Diesel.

DERRICKS

American 30 ton Guy Derrick 106' boom, 116' mast.
American Terry 20 ton Guy Derrick, 100' boom.
Clyde 30 ton stiff leg 90' boom.
Guy Derrick, 15 tons, 115' mast, 105' boom.
American 25 ton stiff leg derrick, 90' boom.
Special 35 ton stiff leg derrick, 100' boom.
Nat'l Bridge 30 ton Guy Derrick, 100'.
American 30 ton stiff leg, 100' boom.

ASPHALT PLANTS

Barber-Greene Model 845. Complete.
Hetherington-Berner Model M-12 1500# Pugmill.
Madsen 4000# Complete. New 1951. Excellent.
Overmander Monotrole Bit. Mixing Plant, T-34.
Hetherington-Berner Moto-Paver.
Barber-Greene Plant 648 Mixer. 836 Dryer Diesel.
Cummer 2500# Hot Mix Plant.
Monotrol complete plant. Three years old.

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Sauerman slack line 1½ yd.; electric 90' mast.
Sauerman 1 yd. with 100 hp. electric motor, complete.
Sauerman 1 yd. with Wakesha gas hoist.

RICHARD P. WALSH CO.
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BONDED QUARRY EQUIPMENT

WRITE, WIRE OR PHONE. IMMEDIATE SHIPMENT FROM STOCK

NEW TROUGHING IDLER CONVEYOR BARGAINS

We take our loss on our stock of short length belting and previous model idlers. You save as much as 50% by buying the BONDED CONVEYOR SPECIALS listed with conveyor belting in two pieces. **Belting** is 4 ply, 28 oz. duck, ⅛" top rubber cover and 1/32" bottom cover.

Belt Width	Length of Conveyor	List Price	Sale Price
18"	25'	$1229	$ 658
18"	45'	1839	960
18"	50'	2054	1043
18"	85'	3209	1581
18"	100'	3704	1814
18"	130'	4694	2173
24"	25'	1322	739
24"	45'	2062	1085
24"	60'	2617	1355
24"	100'	4097	2037
24"	130'	5207	2606
30"	25'	1421	806
30"	65'	3101	1617
30"	80'	3731	2295

Other lengths and belt widths at bargain prices

CONVEYOR BELTING

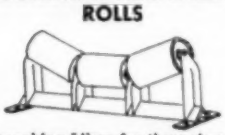
New heavy duty rubber belting having high tensile strength, tough cotton duck, strong carcass and proper flexibility. For boxes, bags, and bulk materials. Troughs easily.

Famous Brands at Deep Cut Prices. Fresh Stock.

Width	Ply	Top Cov.	Bottom Cov.	Duck Carcass	Price
18"	4	⅛"	1/32"	28 oz.	$2.50/ft.
24"	4	⅛"	1/32"	28 oz.	3.23/ft.
30"	4	⅛"	1/32"	28 oz.	3.97/ft.

Additional widths and plies available at low prices. Write for free sample.

TROUGHING IDLERS & RETURN ROLLS



3-roll Troughing Idlers for these sizes:

16" belt	$17.25	30" belt	$19.50
18" belt	18.00	36" belt	20.25
24" belt	18.75	48" belt	21.75

1-roll Return Idlers for these sizes:

16" belt	$6.75	30" belt	$8.25
18" belt	7.13	36" belt	8.75
24" belt	7.50	48" belt	10.25

All steel. Interchangeable with other well-known makes. Replaceable ball bearings. Rust proof ball races—maintenance is negligible.

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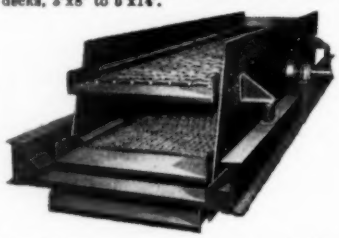

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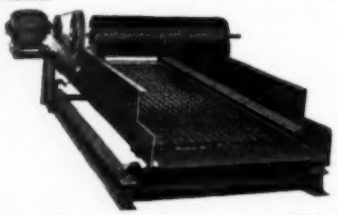

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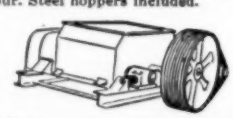

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INDEX TO WHERE TO BUY

Albert Pipe Supply Co., Inc. 181

Bacon-Pietsch Co., Inc. 180
Birmingham Rail & Locomotive Company 181
Bonded Scale & Machine Co. 184
Brill Equipment Company ..180
Builders Rental Equipment Co. 181

Calaveras Cement Company 183
Consolidated Products Co., Inc. 182

Eighmy Equipment Co. 182

Foster, L. B., Co. 182
Frank, M. K. 181

General Machinery Co. 180
Golden Dolomite Company ..181

Heat & Power Co., Inc. 180
Heidenreich, E. Lee, Jr. 180
Heineken, W. P., Inc. 181
Hogan, Chas. H. 181

Johnson & Hoehler, Inc. 181

Lane, T. J., Co. ...182, 183, 184

McClarin Plastics 181
McLeod, Alex T. 181
Meredith Stone Company ..181
Mid-Continent Equipment Co., Inc. 182
Midwest Steel Corp. 181
Mississippi Valley Equipment Co. 181

Natural Tunnel Stone Co. ..183
Nussbaum, V. M., & Co. 181

O'Neill, A. J. 182

Pennsylvania Drilling Co. ..181
Portage-Manley Sand Co. ..180

Samuel, Frank, & Co., Inc. ..182
Schlude, Barney 183
Smith, H. Y., Co. 181
Smith, L. B., Inc. 183

Tractor & Equipment Co. ..180
Troyer, Stanley B. 181

Ullrich, John 182
Unverzagt, G. A., & Sons, Inc. 183

Walsh, Richard P., Co. 183
West Brothers 183
Whayne Supply Co. 182
Wing, R. B., & Son 180

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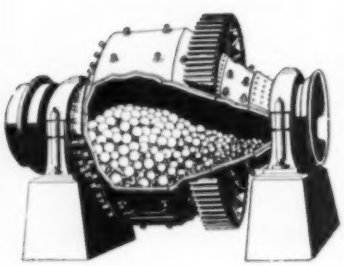

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INDEX TO DISPLAY ADVERTISERS

Allis-Chalmers Mfg. Co. 10, 11, 25, 109
Allis-Chalmers Tractor Division 39, 94, 95
American Brake Shoe Company American Manganese Steel Div. 48
American Chain & Cable Co. 16
American Cyanamid Co. 44, 45
American Rubber Mfg. Co. 89

Babcock & Wilcox Company 8
Baldwin-Lima-Hamilton Corp. 28
Barber-Greene Company 91
Baughman Manufacturing Co., Inc. 163
Bemis Bro. Bag Co. 13
Bergen Machine & Tool Co., Inc. 153
Berg Vault Co. 125
Besser Manufacturing Co. 148, 149, 164, 168, 169
Blaw-Knox Company 136, 165, 178
Bucyrus-Erie Company 31
Builders Equipment Co. 165
Burmeister, L., Co. 160
Butler Bin Company 162

Caterpillar Tractor Co. 6, Inside Back Cover
Chain Belt Company 138, 177
Chevrolet Motor Division 42
Chrysler Corp., Industrial Engine Div. 29
Clark Equipment Company 36, 37
Cleveland Vibrator Company 162
Colorado Fuel & Iron Corp. 107, 115
Colorado Iron Works 120
Columbia Machine Works 131
Combustion Engineering, Inc. 20
Concrete Equipment Co. 161

Davis, Frank D., Company 158
Dodge Trucks 30
Dorr Company 171
Dwight-Lloyd, Inc. 125

Eagle Iron Works 46
Electro Dynamic Div. of General Dynamics Corp. 101
Euclid Division 99

Falk Corporation 50
Farrel-Bacon 120
Fleming Manufacturing Company 161
Ford Trucks 26
Frederick Iron & Steel, Inc. 178
Fuller Company 19, 156

Gardner-Denver Co. 174, 175
General Dynamics Corporation 101
General Motors Corp. 42, 99
Goodrich, B. F., Company 3
Goodyear Tire & Rubber Co. Back Cover
Gulf Oil Corporation 9

Hammond Bag & Paper Company 100
Hardinge Company, Inc. 186
Harnischfeger Corporation 54
Haynes-Stellite Co. 43
Hayward Company 122
Heil Company 117
Heltzel Steel Form & Iron Co. 137
Hendrick Manufacturing Co. 176
Hercules Powder Company 17

Iowa Manufacturing Co. 18, 124

Jaeger Machine Company 135
Johnson, C. S., Co. 132, 133
Johnson-March Corporation 12
Jones, J. A., Concrete Machinery 154
Jones, W. A., Foundry & Machine Co. 97

Kennedy-Van Saun Mfg. & Engineering Corp. 81
Kent Machine Co. 155
Kirk & Blum Mfg. Co. 160
Koehring Company 132, 133

Lehigh Portland Cement Co. 147
LeRoi Company 27
Lessmann Manufacturing Co. 100
LeTourneau-Westinghouse Company 14, 15, 23
Link-Belt Company 1
Lima Shovels 28

Mack Trucks 21
Macwhyte Company 176
Manitowoc Engineering Corp. 24
Medusa Portland Cement Co. 134
Mine & Smelter Supply Co. 120
Moore Dry Kiln Company 163

Nordberg Mfg. Co. 87
Northwest Engineering Co. 5

Oronite Chemical Company 151
Oswalt Engineering Service Corp. 164

Pangborn Corporation 119
Pettibone Mulliken Corp. 110
Pioneer Engineering Works 124
Prat-Daniel Corp. 35

Quick-Way Truck Shovel Co. 79
Quinn Wire & Iron Works 164

Raymond Bag Company 4
Raymond Division 20
Reichard-Coulston, Inc. 163
Resisto-Loy Company 179
Riddell, W. A., Corp. 161
Rockwell Spring & Axle Co. 40, 41
Roebling's, John A., Sons Corp. 107
Rollway Bearing Co., Inc. 38
Ryerson, Joseph T., & Son, Inc. 186

Sauerman Bros., Inc. 123
Schield Bantam Company 185
Screen Equipment Co., Inc. 92
Simplicity Engineering Company 122
Sintering Machinery Corp. 125
Smidth, F. L., & Co. 32
Smith Engineering Works 85, 105
Smith, T. L., Company 130
Standard Dry Kiln Company 168
Star Expansion Products Co. 166
Stearns Manufacturing Co., Inc. 170
Stoody Company 77
Stulz-Sickles Co. 126
Syntron Company 126

Taylor-Wharton Iron & Steel Co. 121
Texas Company 56
Thermobloc Div. 35
Thew Shovel Co. 150
Timken Detroit Axles Div. 40, 41
Towmotor Corporation 159
Travel Drill Co., Inc. 179
Traylor Engineering & Mfg. Co. 7

Union Carbide & Carbon Corp. 43
Union Wire Rope Corporation 102, 103
Unit Crane & Shovel Corp. 157
United States Steel Corp. 128
Universal Atlas Cement Co. 128
Universal Engineering Corp. 110

Vulcan Iron Works 173

Western Machinery Company 22
Western Precipitation Corp. 172
Wilfley, A. R., & Sons 123
Willard Concrete Machinery Sales Co. 158
Williams, C. K., & Co. 154
Williams Patent Crusher & Pulverizer Co. Inside Front Cover
Williams, Roger F. 164
Wood, Charles E., Company 178

Yuba Manufacturing Co. 113, 124

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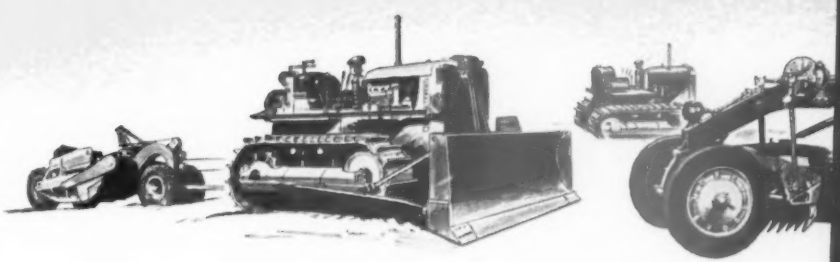

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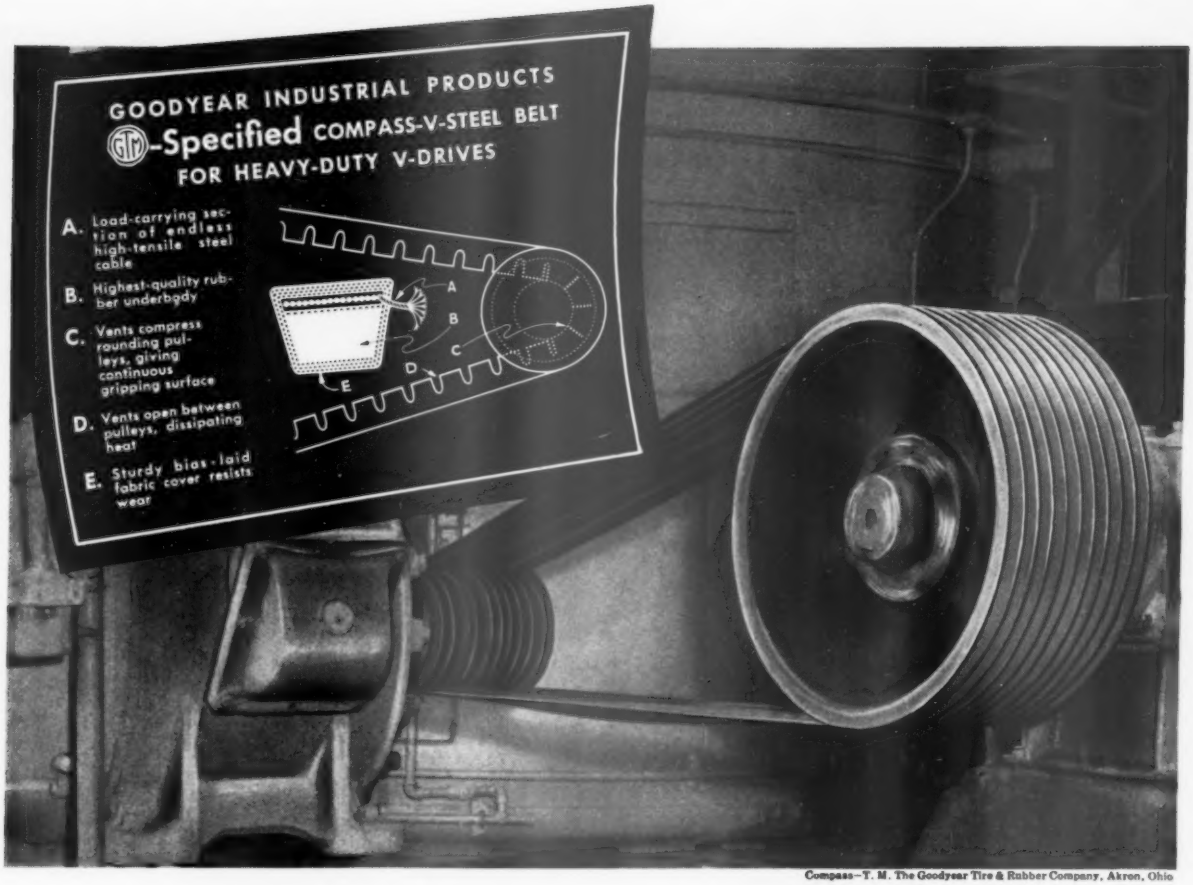

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